

# PUBLIC HEALTH REPORTS

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## **frontispiece**

The late Paul Ivanoff, teacher and interpreter, was Alaska's first Eskimo sanitarian. A picture story about Eskimo sanitarians appears on pages 998-1000.

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## *Published concurrently with this issue:*

PUBLIC HEALTH MONOGRAPH No. 52 . . . Opiates and opiate antagonists. A review of their mechanisms of action in relation to clinical problems.

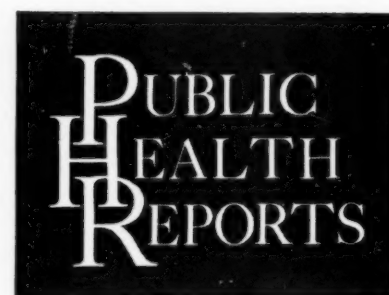
*Abraham Wikler*

39 pages. A summary and information on availability appear on pages 1033-1034.

PUBLIC HEALTH MONOGRAPH No. 53 . . . Psychiatric consultation for nonpsychiatric professional workers.

*Beulah Parker*

23 pages. A summary and information on availability appear on pages 1051-1052.



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U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

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# Investigations of Staphylococcal Infection Acquired in Great Britain's Hospitals

R. E. O. WILLIAMS, M.D.

*In his brief account of the work on staphylococcal infection in British hospitals during the past 10 years, Dr. Williams offers the following observations:*

*"Practically all the staphylococci responsible for epidemics are resistant to penicillin and most are resistant to other antibiotics as well. It is possible that by now selection by antibiotic treatment has increased the proportion of virulent strains as well as of antibiotic resistant strains, but I do not think there is good evidence that the resistant strains of today are fundamentally more virulent than the sensitive strains of yesterday. If the use (or misuse) of antibiotics has increased the incidence of staphylococcal cross-infection, this is more likely to be due to our reliance on drugs instead of asepsis for preventing infection rather than to any malign effect of the antibiotics in selecting especially virulent staphylococci. If there were no cross-infection, the development of drug resistance would have a relatively limited importance."*

IT IS convenient to start a review of British investigations on the hospital spread of staphylococcal infection by recalling the work of Devenish and Miles (1). They studied a

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*Dr. Williams, director of the Streptococcus, Staphylococcus, and Air Hygiene Laboratory, Public Health Laboratory Service, London, England, delivered this paper at the National Conference on Hospital-Acquired Staphylococcal Diseases held in Atlanta, Ga., on September 15, 1958. He wishes to acknowledge the benefit derived from numerous discussions with colleagues, especially Drs. R. Blowers, R. A. Shooter, O. M. Lidwell, and M. Patricia Jevons.*

series of postoperative infections in a surgical unit and were able to trace them quite clearly to the introduction of staphylococci, at the time of operation, by one surgeon who was a healthy nasal and skin carrier. This study was important not only because it showed the potential danger of a healthy carrier of staphylococci but also because it was the stimulus for a great deal of basic work on the frequency with which the cocci were carried by normal adults (2, 3).

There was in Britain a great deal of interest in hospital infection during the war years. At that time the hemolytic streptococcus was regarded as the important cross-infecting organism, and there were at first only sidelong glances at the staphylococcus. The streptococcus offered a simpler problem than the staphylococcus has proved to be, even without considering antibiotics, because its rarity in fresh wounds and relative rarity in the respiratory tract made it immediately clear that cross-infection, not self-infection, must be involved. The work during the war was important in showing that streptococcal cross-infection of surgical wounds could be controlled by closing channels of contact infection, by no-touch dressing techniques, and by the maintenance of an aseptic routine in the wards as rigorous in its way as those already regarded as standard in the operating theater (4).

For the protection of most wounds from streptococci, attention to contact infection seemed to suffice. But with burns this was not enough, and Colebrook (5), in pioneer work at Birmingham in 1950, supplemented the no-touch dressing technique with chemoprophylaxis.

laxis and the use of an air-conditioned room for performing the dressings.

At about the same time Miles and I were investigating infections in small industrial wounds (6). Sepsis was usually due to staphylococcal infection, and the staphylococci were very commonly those carried on the patient's skin before the infliction of the wound. We thought that in these small wounds streptococci indicated hospital infection, staphylococci self-infection.

Any idea that this distinction would prove generally true was soon shattered when it was observed that penicillin-resistant staphylococci were becoming increasingly common in surgical wards, and that the resistant strains differed in phage type from the sensitive strains previously infecting the patients and probably did not arise as variants of them (7). The fact that staphylococcal cross-infection in the wards became evident when the staphylococci had acquired the mark of drug resistance has led some to think that cross-infection is a new phenomenon, characteristic of the drug-fast strains. I do not think there is any reason to believe this, although reliable statistics of incidence for pre-antibiotic days, as for the present, are difficult to find and to interpret.

#### **Prevalence of Hospital Infection**

Determination of the prevalence of hospital infection is the first question that faces us today. Generally, the incidence of sepsis cannot be satisfactorily discovered from a review of ordinary hospital case records. Several hospitals have therefore devised special sepsis records. The surgical unit at St. Bartholomew's Hospital in London keeps a "wound book" in the operating room (8). In this book all operations are recorded and it is noted whether the wounds are healing satisfactorily or developing sepsis.

Elsewhere similar records have been kept in the wards (9). Many hospitals have systems for reporting cases of infection to the laboratory or to an infection control officer, usually the hospital's medical bacteriologist, whose function it is to keep a special watch on all aspects of infection throughout the hospital. It is our feeling that systems that simply re-

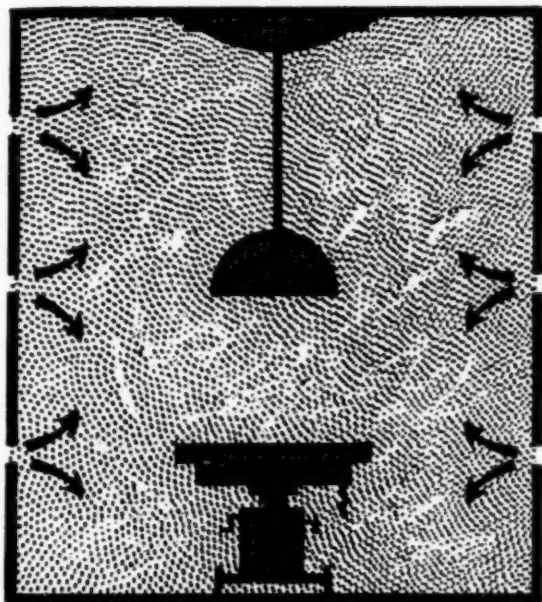
quire notification of cases of infection are less likely to give complete records than those that demand recording of the outcome, whether infection develops or not. Most hospitals now have an infection control committee, which includes representatives of all the important departments within the hospital, and in many cases also includes the medical officer of health of the district in which the hospital is situated.

The development of these systems is relatively new, and little information has yet been published on the prevalence of staphylococcal infection. For this reason the Public Health Laboratory Service in England and Wales has instituted a survey of postoperative infection in selected hospitals in different parts of the country. All clean operations performed by one surgical team in each hospital will be observed for 1 year, and the mode by which wounds heal will be assessed jointly by the surgeon and the bacteriologist. Preliminary results from three hospitals, for example, show from 5 to 9 percent of clean surgical wounds developing staphylococcal infection with clinical sepsis (B. Moore and R. J. Henderson in personal communications). The rates for some of the other hospitals are mostly about 5 percent.

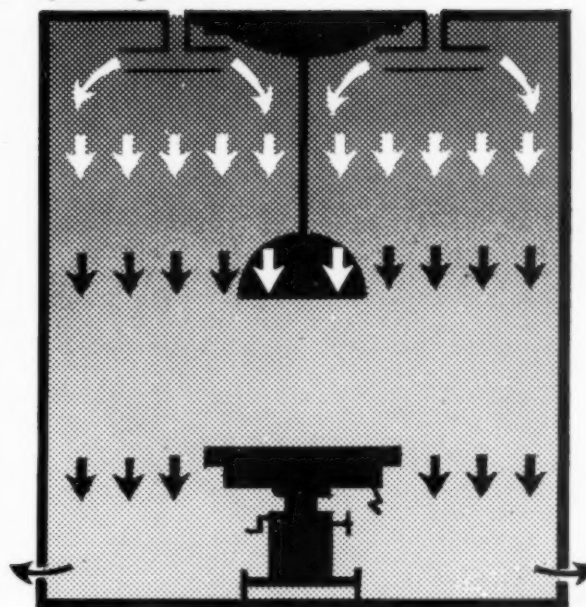
A number of surveys have also been made of the incidence, apart from epidemics, of skin sepsis in newborn babies. We made one such study in a maternity hospital 2 years ago and in a 6-month period found that 15 percent of the babies developed some staphylococcal lesion (conjunctivitis or skin sepsis) before discharge. Dr. M. H. Hughes, in an unpublished survey in a hospital in South Wales, found an incidence of 14 percent, but lower rates have been observed by others. The incidence of breast abscess is very difficult to determine because the disease so often develops after the patient's discharge from the hospital (even when this is at the 10th to 12th day as it is in Britain) and is treated by a different physician. Hughes found an incidence of 1 percent, and others have reported very similar rates (B. Wilkinson in a personal communication, 1958).

It seems that, even apart from recognized epidemics, 5 percent or more of clean operation wounds and 10-15 percent of newborn babies develop septic lesions due to staphylococci.

### Ventilation in an Operating Room



CONVENTIONAL (turbulence)



PISTON

These figures are high enough, but to them must be added the quota from epidemics in which the attack rates may be much higher. The only measure we have of the frequency of such epidemics is the number of incidents from which staphylococci are sent for type identification. In 1957, the Staphylococcus Reference Laboratory at Colindale, London, received specimens from 30 outbreaks with 10 or more patients affected. The laboratory serves an area with a population of 13½ million, and it is sent material only from a proportion, perhaps a small proportion, of the epidemics that occur.

Nor do wound infections and infant sepsis exhaust the list of staphylococcal infections that are acquired in hospitals. Pneumonia is certainly not uncommon: we observed 5 cases of pneumonia in the course of a surgical ward epidemic having 17 cases of wound infection and an attack rate of about 2 percent in the same ward in a subsequent 8-month period free from epidemics (10, 11). Urinary infections and skin lesions among adult patients are also seen.

Postoperative staphylococcal diarrhea has been observed in a number of hospitals, both in sporadic cases and in epidemics (12), but the incidence is too low to obtain a general attack rate.

In some epidemics, particularly those due to

staphylococci of phage type 80/81, skin infections among the staff are very common (13).

### Air Hygiene in the Operating Room

The institution of the "wound book" for recording the incidence of postoperative sepsis led Shooter and his colleagues to an elegant study on air hygiene in the operating room (8). Over a period of 8 months, 9 percent of clean surgical wounds developed postoperative sepsis, and the staphylococci from these patients fell into many different phage types. The operating room was at the top of the hospital and its ventilation was such that air was sucked into the room from the adjoining corridors and ultimately from the wards. It seemed likely that this air stream carried staphylococci from the wards into the operating room, where they could enter the wounds. This idea was confirmed when adjustment of the ventilation to provide a positive pressure of air within the operating room was followed immediately by a decrease of from 9 to 1 percent in the incidence of sepsis apparently due to theater infection. There was also a striking reduction in the number of bacteria found in the air of the operating room.

Blowers and his colleagues (14) had earlier studied an operating room in a thoracic surgi-



cal unit in which suction ventilation led to the contamination of air in the operating room with ward staphylococci. As a consequence of these studies and of the still earlier work of Bourdillon and Colebrook (15), it is now accepted that when operating rooms are built within the hospital, they need to be ventilated under positive pressure to exclude contaminated air issuing from the hospital. The rate at which the air within the room is changed must also be great enough to insure that any contamination liberated at one operation is cleared before the next operation is commenced. This usually implies a rate of 10-20 air changes per hour. Blowers has been investigating the best ways of getting the required rate of air changes with the least expenditure of energy, and he has shown that it is advantageous to bring the air in at the ceiling in such a way that it tends to descend through the room in a piston fashion, rather than by inducing turbulent mixing (see chart). This piston ventilation can be achieved by proper design of the air inlets and, in some circumstances, by using the incoming air as the principal source of heating for the room. The change from turbulent mixing to downward displacement may have another advantage. With a really steady piston effect it may be possible to protect the sterile area to some extent from contamination dispersed by the staff even within the operating room.

In several reports, Blowers has stressed how the number and activity of the staff in the operating room affect the bacterial count of the air. He showed, in one instance, that training the staff to avoid all unnecessary movement reduced the count as much as improving the ventilation did (16, 17), though the source of contamination in the two cases is different. Blowers' observations and the recent work of Hare and his colleagues (18, 19) on the dispersal of staphylococci from contaminated clothing of nasal and skin (especially perineal) carriers of staphylococci stress the importance of a rule that all persons working in the operating room should change all their clothing (which is not by any means general in Britain) or should wear some special protective suit as suggested by Duguid and Wallace (20).

The operating room air can be contaminated by ward staphylococci not only by air streams

from the ward but also by blankets and the like used to cover the patient on his journey to the operation. It is best that the patient be covered with sterilized material sent to the ward from the operating room. If he has to be transferred from the operation table directly to his bed, this should not be done within the operating room itself.

### Carriers in the Operating Room

Airborne infection in the operating room is probably not uncommon, but probably it is not often responsible for epidemics of sepsis. Several epidemics of operating-room sepsis have been traced to staff members who were dangerous staphylococcal carriers. In some instances the carrier had a septic lesion as did the surgeon described by McDonald and Timbury (21); in others the carrier was apparently quite healthy (1, 22). Knowing how widespread the staphylococci are on the skin of anyone with a septic lesion and knowing the frequency of accidental glove-puncture during surgery, it is not surprising that a surgeon with a boil infects the patients on whom he operates. The healthy carriers present a much greater problem, because we know that some 50 to 70 percent of all hospital staff carry staphylococci in the nose and 20-40 percent carry them on the skin. Why then do they not cause epidemics more often? It may be that some carriers are qualitatively different from others: the surgeon described by Devenish and Miles (1) seems to have been a particularly profuse carrier on the skin of his forearm. Or it may be that the staphylococcus has to be virulent: the carrier described recently (10) certainly had a staphylococcus of more than average virulence, as judged from its behavior in the ward.

### Carriers in the Wards

The peculiar ability of some individuals to spread their staphylococci has also been recognized as responsible for the spread of infection in wards. In maternity departments there have been several outbreaks of infection (23, 24) in which a single nurse who was a carrier of the epidemic type of staphylococcus seemed to be responsible for many cases of infection, and Jellard (25) has recently referred briefly to one

such nurse who started outbreaks in several wards in which she worked.

In our own studies in a surgical ward at St. Bartholomew's Hospital (10, 11), we thought that we could distinguish particular patients who were actually or potentially dangerous. For example, it seemed very likely that a sharp epidemic in 1956 was started by a patient with a staphylococcal pneumonia; he was probably the source of several ward infections and he may well have infected the member of the surgical team who became a carrier and certainly infected many patients at operation.

In later studies, we recognized a number of patients who were especially apt to disperse their staphylococci. In some cases there seemed to be a good reason for this aptitude, such as urinary infection with incontinence or pneumonia with a tracheotomy. But the individual who contaminated air to the greatest degree was a healthy carrier.

We were so impressed by the ability of some infected patients to disperse their staphylococci that we rigorously isolated in a separate room any patient infected by what appeared to be a dangerous staphylococcus, which we provisionally took to be one resistant to tetracycline. The physical isolation was, of course, supplemented by a very strict isolation-nursing technique, great care being taken that no material that had been near the patient was used in the ward without sterilization. On 6 separate occasions in 2 years of this regimen we have been able to isolate all patients with septic lesions as well as healthy carriers known to be infected with supposedly dangerous types. Only once did infection spread to another patient, probably because of a breakdown in the isolation. On one occasion when we isolated the septic patients but had insufficient space to isolate all the carriers, two secondary cases occurred; the strain was of phage type 80, which is known to be very communicable.

The isolation nursing of infected surgical patients has in general been curiously neglected; yet, when we see the extent to which infected patients can contaminate the ward, it surely seems ridiculous to nurse them among patients with susceptible wounds that have to be redressed daily. One of the most valuable contributions that hospital administrators can

make to the solution of cross-infection may well be the provision of really adequate isolation facilities in all wards, sufficiently equipped to simplify the routine of isolation nursing.

### Spread of Infection in Maternity Wards

Although infection is commonly introduced into a maternity ward by a nurse who is a carrier, it seems clear that subsequent spread is often from one baby to another. In seeking the route of this spread, some have stressed the umbilical stump as a reservoir. It recently became fashionable to leave the stump uncovered, and it was easy to show that in these circumstances the stump became contaminated with staphylococci as or more quickly than the nose. Jellard (26) found that if the umbilical stump was painted daily with an antiseptic dye, the staphylococcus seemed to spread less readily through the nursery. Her studies, however, were confined to the rate at which newborn babies acquired bacteria. Gillespie (27) has had a similar experience with the use of a hexachlorophene dusting powder for the umbilicus. Cook, Parrish, and Shooter (28) studied a variety of nursing techniques for their effect on the rate of nasal colonization. Although they could not reduce the rate greatly by any method, they found the best to be the reservation of individual clean gowns for the nurse's use when handling each baby, coupled with the application of antiseptic dye to the umbilical stump. We have recently found that air disinfection with ultraviolet irradiation had no effect on the nasal colonization rate, but that daily bathing with soap containing hexachlorophene might be of some use. Forfar and MacCabe (29) could detect no effect on the incidence of minor sepsis when the nurses in one of two nurseries gave up wearing special gowns and masks.

### Environmental Contamination

To the bacteriologist, the ease with which staphylococci can be isolated from ward dust and from bedding and curtains is inescapable. It seems inconceivable that such heavily contaminated material should not be a reservoir for the spread of infection to patients. This thought has prompted many attempts to eliminate the contamination. The wool blanket



offers the greatest problem, for dust and fluff are readily dispersed from its surface, and ordinarily it is laundered at too low a temperature to kill staphylococci. Indeed washing is so harmful to blankets that it has commonly been practiced as rarely as possible.

As a legacy from earlier work on streptococcal infection we had the method of oil impregnation of wool blankets to prevent dispersal of the bacteria, without killing them (30). Later Blowers and Wallace (31), following earlier work by Rountree and by Barnard, devised a simple method for disinfecting wool blankets during laundering, using a nonionic detergent for washing and a cationic detergent for disinfection. This process, which effectively kills staphylococci—though not *Pseudomonas pyocyanea* or *Mycobacterium tuberculosis*—and which does little harm to the blankets, has been quite widely adopted. Other methods are also being investigated by which wool blankets can be disinfected safely.

But clearly a blanket that could withstand the laundry temperatures used for linen and cotton material would have great advantages. Blowers, Potter, and Wallace (32) tested three materials: loose woven cotton, thick toweling, and Terylene, all of which can be boiled. Both cellular cotton and the toweling make good blankets and can be recommended.

It is therefore perfectly possible to provide patients with sterilized bedding, but it is still not known just how much good we may expect to do by this. The effect of sterilized bedding on the air contamination in the wards has been tested somewhat, but there is very little work yet on the incidence of sepsis. Nevertheless, the general view seems to be that it is undesirable to harbor in the ward a large pool of staphylococci on blankets and curtains and that their regular disinfection is likely to reduce the incidence of sepsis.

We have made several studies of the bacterial content of the air of a surgical ward (11). We found a basal level of about 0.1 particle containing *Staphylococcus aureus* per cubic foot. Much higher counts (0.5 to 5.0 particles per cubic foot) were found, even during relatively quiet periods in the ward, when one of the patients was an active disperser, but such high counts were not constantly associated with the

occurrence of cases of sepsis due to spread within the ward, although it is true that a peak occurred whenever spread took place.

#### Treatment of the Carrier State

The inanimate hospital is an enormous reservoir of staphylococci derived from infected patients and from carriers, but staphylococci do not multiply in dust or on bedding and it seems more rational to attempt to control dispersal by an attack on the breeding places rather than on the resting places. Gould (33, 34) has made a series of studies of the antibiotics and disinfectants applied to the nose to eliminate the carrier state. He finds that applying a cream containing, for example, 0.5 percent neomycin and 1 percent chlorhexidine (Hibitane) for 7 to 14 days rids most carriers of detectable nasal staphylococci for a period of a few weeks. This method used by several workers has often been successful for treating nurses who have become carriers during an epidemic (35), but some carriers seem to be quite resistant to this form of treatment, even though their bacteria are sensitive to the antibiotic in vitro. Gould and Allan (36), working on the assumption that hospital infection with staphylococci was derived from carriers among the staff, treated all the staphylococcal nasal carriers on the staff of a small hospital with a tetracycline cream for 1 week and found that the incidence of hospital infection decreased strikingly during the period following this treatment. On the other hand, Gillespie (27) has proceeded on the assumption that the patients are (or become) nasal carriers and infect their own wounds. He therefore applied an antibiotic cream to the patients' noses from the time of their admission to the ward and throughout their stay, and the frequency with which staphylococci were isolated from open wounds fell from about 15 to about 3 percent. The incidence of clinical sepsis was not reported.

Clearly, these two concepts need further study. In our first year's work in the surgical ward at St. Bartholomew's, Dr. Shooter and I could find no evidence that the wound infections were derived from either the patients' or the staff's noses; infection seemed to be from one infected patient to another. On the other hand, during the past year we have studied 15

patients who developed postoperative sepsis, and 7 of them were nasal or skin carriers of staphylococci before the operation. One might think that when we reach the stage at which we can attribute so much of the postoperative infection to the patients' own preoperative staphylococci we may be nearing our goal. But we need to beware, for patients who are in hospitals for any time before an operation often become nasal carriers of the hospital staphylococcus (37) and this hospital strain may be the one that infects the wound.

The records of the staphylococci sent to us at Colindale for typing reveal an interesting fact on the frequency of carriers among the staff. In 4 years we typed material from staff and patients in 94 separate epidemics. Altogether about 18 percent of the staff carried the type of staphylococcus that was locally epidemic, but there was a striking difference between epidemics due to staphylococci of phage group 1, with some 25 percent of the staff who were carriers, and those of other phage groups, with 3-13 percent carriers (see also 38). The notorious type 80 (or 80/81) did not differ in this respect from other types in phage group 1. Apart from type 80, which occurs in all sorts of hospitals, phage group 1 strains are not often epidemic outside maternity hospitals. The results suggest that widespread nasal carriage of the epidemic strains among hospital staffs is not common enough to justify general nasal disinfection as a routine and that it is more likely to be relevant in maternity hospital outbreaks than in outbreaks in surgical wards, unless the infecting strain is type 80.

Chemoprophylaxis and chemotherapy of the wounds have been widely used, but too rarely precisely assessed; and only in the management of burns has a serious attempt been made to integrate antibiotic treatment with the work on the prevention of cross-infection (39). There is a great need for more detailed work to discover just what can be prevented by prophylaxis, and to what extent treatment can, at least, prevent an infected wound from being a dangerous source of cross-infection.

#### **Epidemic Types of *Staphylococcus aureus***

It used to be thought that all strains of coagulase-positive staphylococci were similar in

virulence, but this idea can certainly be held no longer. On the other hand, the recent worldwide spread of one type known as 80, or 80/81 (or 52/44A/42C/47C, and the like), has led some to think that it is only this strain that is important and strains of all other types can be neglected. This idea is likewise quite untenable.

Our studies in the surgical wards emphasized the different capabilities of different strains of staphylococci. From all sites in the ward, in an 8-month survey, some 186 different strains of *Staphylococcus aureus* were isolated, but only 13 of these caused disease, and only 3 caused disease in more than 1 patient. Some strains seemed to have remarkably little virulence. One was present in the air of the ward, often in large numbers, for 6 months, but never caused a secondary case of sepsis and only colonized 3 patients' noses. Another was present in the ward for 8 months without causing any secondary cases of sepsis, although it colonized the noses of 57 persons. In contrast, the strain present in the same ward in the previous year caused 34 cases of wound sepsis and other disease in a 2-month period. It was widespread in the air and dust, but it colonized only two noses.

I have made an analysis of the phage types of staphylococci from septic lesions sent to Colindale in the 4 years 1954-57. Altogether we had 1,131 independent strains (counting all the strains from any one epidemic as one strain), 638 from surgical units and 493 from maternity units. A great many different types could be recognized, but some 20 types or groups of closely related types were each represented by 10 or more strains. Among the 1,131 independent strains, 178 were, in the particular time and place, epidemic strains, and 69 percent of these were found in no more than 7 types. Type 80 had the highest proportion of epidemic strains. This type was equally common in maternity and surgical units; but other common epidemic types were 52A/79 and 71 in maternity units and 75/77, 47/53/75/77, and 7/47/53/54/75 in surgical units.

In Britain, as elsewhere, type 80 has spread rapidly in the last few years; at Colindale we had specimens from 5 or 6 epidemics in each of the 3 years 1954-56, and from 21 epidemics in

1957. Thirty percent of all the strains that we had from septic lesions in 1957 proved to be type 80, although this figure may be somewhat inflated by the general interest shown in this particular type. But even now, quite extensive epidemics due to other phage types are being seen.

Practically all the staphylococci responsible for epidemics are resistant to penicillin and most are resistant to other antibiotics as well. It is possible that by now selection by antibiotic treatment has increased the proportion of virulent strains as well as of antibiotic resistant strains, but I do not think there is good evidence that the resistant strains of today are fundamentally more virulent than the sensitive strains of yesterday. If the use (or misuse) of antibiotics has increased the incidence of staphylococcal cross-infection, this is more likely to be due to our reliance on drugs instead of asepsis for preventing infection, rather than to any malign effect of the antibiotics in selecting especially virulent staphylococci. If there were no cross-infection, the development of drug resistance would have a relatively limited importance.

### Conclusion

Although some progress seems to have been made in understanding what happens in hospitals, it is clear that much remains to be done. In the laboratory, especially, factors related to virulence need to be explored and in the wards all the numerous measures that are advised for the prevention of cross-infection need to be more precisely tested. For it is certain that if we prescribe too many rules their observance will be neglected.

In my opinion there is no one way in which staphylococci spread in a hospital, and there is no one prophylactic method by which spread can be prevented. The routes of infection are numerous and probably often devious, and the precautions needed are many and often complex.

Staphylococcal hospital infection is an infectious disease, with this subtlety, that while most staphylococci are, when given the best opportunity, able to produce septic lesions, relatively few of them seem able to produce

epidemics. Probably all hospitals have their endemic level of staphylococcal infections, while some, from time to time, suffer epidemics. Our preventive measures have therefore to minimize the endemic level, to prevent the emergence of epidemics, and to terminate epidemics when they occur.

It seems probable that an epidemic is usually started when an especially virulent staphylococcus is introduced into a hospital by someone who is able to disperse it readily. If we are prepared to try, it should not be too difficult to recognize people who are likely to disperse the bacteria, but we have at present no satisfactory measure of the virulence of staphylococci other than the retrospective record of what a particular strain has achieved. There is some correlation of epidemicity with phage type, but we know of many introductions of well-known virulent types into hospitals with no subsequent spread. Perhaps this means that they were not being dispersed sufficiently, or very likely there may be variations of virulence within the type. The combination of two factors, virulence and dispersal must be present; but we must hope that these two, although necessary, are not sufficient. Our preventive measures ought to be such that we can limit the spread of virulent strains, even from the profuse dispersers.

When an epidemic has started, the best approach to control it is to attempt the elimination of the epidemic strain from the hospital. This means, first, definition of the type of staphylococcus that is causing infection in the patients, and, second, a search for carriers of this type in the hospital personnel or patients. Sometimes such a search will reveal the one dangerous carrier whose exclusion terminates the epidemic. Often the search will reveal several carriers. Even though it may be possible to judge from epidemiological analysis that one is important in an epidemic of any severity, it is worth treating or excluding all of them. These searches, with the examination of fomites and the typing of all staphylococci, will often exceed the facilities of the hospital laboratory. Outside agencies, such as public health laboratories, should be equipped and ready to help in these investigations, and their help should be readily sought by the hospitals.

The prevention of outbreaks would be greatly



helped by a laboratory test of virulence so that the potential initiators of epidemics could be isolated. Otherwise, it seems that our only hope is to regard all persons, whether surgical patients, babies, or staff, with staphylococcal lesions as having virulent strains, and to treat them in strict isolation as one would cases of infectious disease. It would also be wise, when possible, to isolate known carriers of strains resistant to many antibiotics. The hospital also needs to have a recording system sensitive enough to recognize quickly any increase in the prevalence of infection and someone with clinical authority to scrutinize the records and initiate the investigations that may be able to stem an epidemic.

Of general preventive measures, the aseptic handling of patients should receive the greatest stress. Every staff member's approach to the patient must be informed by a realization of the infectiousness of staphylococcal infection. Everything taken from the infected patient must be sterilized, and all material used for the treatment of all patients must not only be sterilized but must be kept sterile right up to the time that it is used. The provision of proper facilities and equipment is an essential contribution from the administrators; the rapid and detailed recognition of the infecting bacteria is the duty of the laboratory; but there are no gadgets and no drugs or vapors that can relieve the people who handle the patients of their perennial responsibility for handling them aseptically.

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## Sanitary Engineering Courses in Radiation and Water Analysis

A course in sanitary engineering aspects of nuclear energy will be conducted at the Robert A. Taft Sanitary Engineering Center, Public Health Service, in Cincinnati, Ohio, December 1 through 12, 1958. Designed for engineers and scientists in public health, especially those in supervisory posts, the course covers the broad aspects of radiological health.

The program opens with a discussion of radiation fundamentals and instrumentation, then focuses on radiation protection, nuclear reactor operations, and measurement and evaluation of environmental radiation contamination.

During the same 2-week period, the center will give a course in chemical analyses for

water quality, for graduate chemists and professional people with extensive background in water supply and water pollution control.

Among subjects covered are: measurement of strength and effect of oxygen-demanding wastes; investigation of toxic industrial wastes, including the determination of toxicity through bioassay; characterization of synthetic organic wastes; water supply problems; and survey and administration, including basic data program.

Applications may be obtained from the Chief, Training Program, Robert A. Taft Sanitary Engineering Center, 4676 Columbia Parkway, Cincinnati 26, Ohio, or from a Public Health Service regional office.



*Prevention of chronic disease, services for long-term patients, and social programs related to their health were discussed at a recent meeting held by directors of State chronic disease programs and the Subcommittee on Long-Term Illnesses and Aging of the Association of State and Territorial Health Officers at the University of Michigan, Ann Arbor. Of the 20 papers delivered, 4 have been selected for publication here in slightly revised form.*

## Progress in Control of Chronic Disease

DAVID SEEGAL, M.D., and ARTHUR R. WERTHEIM, M.D.

THE MEDICAL profession's awareness of the preventive aspects of chronic illness is just coming of age. Much has already been written and said about this subject; many committees and public health agencies have pressed home salient points; and the current state of our knowledge in the field has been treated comprehensively in the volume, *Prevention of Chronic Illness*, issued in 1957 by the Commission on Chronic Illness. The impetus of past efforts now finds expression in the general acceptance of the belief that chronic disease represents the most important problem facing medicine today and in major breakthroughs in the primary or secondary prevention of certain long-term diseases. (In primary prevention, the occurrence of a disease is averted; in secondary prevention, the progression of a disease from its early, unrecognized stage to a more severe stage is halted.)

In discussing chronic diseases with physicians and medical students we find there is a common tendency to consider as chronic only

those long-term diseases not yet subject to specific treatment or to primary or secondary prevention. This attitude naturally fosters a pessimistic outlook.

Man's memory can be short and the physician is not exempt from this frailty. In the field of acute diseases, our students have to be reminded that in New York City alone there were 166 deaths from yellow fever in 1822, 5,071 deaths from cholera in 1849, and 552 deaths from typhoid fever in 1911.

The physician's memory of the advances in prevention and control of some long-term illnesses is beclouded and often dominated by our present inadequacies rather than by our past accomplishments. Unwittingly, he gives too little thought to the chronic diseases which are now preventable or controllable. These diseases represent scientific battles already won even though the strategy and tactics of the clinician and the public health officer are still required to implement the measures for their control.

Just what are these diseases? In 1949, my associates and I compiled a list of representative chronic diseases that were largely controllable, partially controllable, or uncontrollable (see table 1).

Some changes in classification might be made at this date, and some additions should be made. For example, retrolental fibroplasia should be added to the largely controllable group; dental

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caries, paralytic poliomyelitis, certain forms of glaucoma, and some instances of the nephrotic syndrome might be added to the partially controllable group.

Clinical findings during the past few years indicate that the malignant phase of primary hypertension may also be added to the list of partially controllable chronic diseases. Low sodium diets, sympathectomy, and, more recently, the antihypertensive drugs have extended the lives of some hypertensive patients. However, data on the influence of these forms of treatment on the uncomplicated phase of primary hypertension are less convincing and at present do not justify its addition to a list of therapeutic successes. Although atherosclerosis appears in the group of uncontrolled chronic diseases, extensive laboratory, epidemiological, and clinical investigations suggest that a breakthrough may not be too far distant.

These advances have occurred in recent years. In my student days, our teachers told us there were no effective methods to control significantly such long-term diseases as diabetes mellitus, pernicious anemia, tuberculosis, any form of congenital heart disease, sprue, cirrhosis of the liver, Addison's disease, or rheumatic fever. That picture has changed and is continuing to change favorably.

These facts seem worthy of reemphasis because of some recent divergent opinions. Although the former Surgeon General of the Pub-

lic Health Service, Dr. Leonard A. Scheele, has expressed the view that the solution of critical problems in chronic disease is much nearer than is generally recognized, his optimism is not shared by all. Dr. Lowell T. Coggeshall, for instance, has been quoted as stating that "progress against chronic illness and disability is disappointingly slow."

In our view it has been surprisingly rapid. For example, witness the progress made in the control of heart disease since the turn of the century. The accompanying chart lists the eight chief causes of past and present cardiac disorders. The deflected arrows symbolize increasing control in 6 of the 8 diseases; hypertension and atherosclerosis remain.

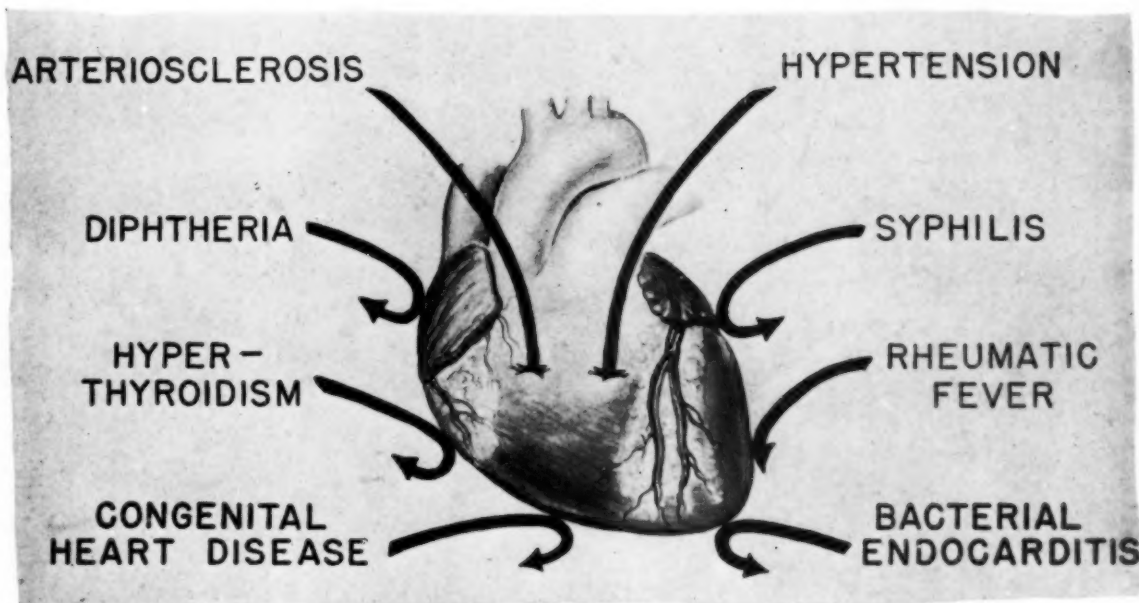
As a fourth-year medical student, I remember seeing a child who was believed to have three disorders of the heart: a congenital lesion which I think was a patent ductus arteriosus, inactive rheumatic heart disease, and *Streptococcus viridans* endocarditis.

I wonder what would have happened if, at that time, I had asked my instructor whether each of these three diseases would be amenable to prevention or control during my lifetime. My guess is that my name would have turned up on the dean's desk with a request for a psychiatric examination.

Another aspect of prevention is the age of onset of many chronic diseases. In the past it was chiefly the "endings" of chronic illness

Table 1. Status of chronic diseases, 1949

Largely controllable	Partially controllable		Largely uncontrollable
Diabetes mellitus	Congenital heart disease	Cretinism	Certain congenital defects
Syphilis	Addison's disease	Diabetes insipidus	Certain neurological diseases
Hyperthyroidism	Certain neuroses and psychoses	Gout	Certain psychoses
Myxedema	Acromegaly	Coeliac disease	Certain neoplasms
Hyperparathyroidism	Hemophilia	Lung abscess	Chronic glomerular nephritis
Sprue	Bronchiectasis	Hay fever	Hypertension
"Alcoholic" neuritis	Trypanosomiasis	Erythremia	Arteriosclerosis
Pellegra	Tuberculosis	Actinomycosis	
Beriberi	Osteomyelitis	Rheumatic fever	
Scurvy	Rheumatoid arthritis	Asthma	
Rickets	Myasthenia gravis	Myotonia congenita	
Hookworm infestation	Familial periodic paralysis	Epilepsy	
Malaria	General paresis	Bacterial endocarditis	
Amebiasis	Disseminated lupus erythematosus		
Thrombocytopenic purpura			
Familial hemolytic jaundice			
Pernicious anemia			



**Progress in the Control of Heart Disease**

which attracted the physician's attention and care. Today the "beginnings" of long-term disease are being revealed to the doctor because of painstaking clinical, physiological, biochemical, pathological, and epidemiological studies. This new knowledge must perforce accelerate the rate of development not only of therapeutic but also of preventive measures.

Evidence now indicates the need for reappraisal of the concept that the so-called degenerative diseases of middle life are initiated about the age of 40. The average age of onset and the minimal age of onset of clinical illness (symptoms or signs) for a few of these disorders are shown in table 2. Although organ failure may be generally manifested in middle age, the data support the belief that some chronic illnesses may be recognized in early life.

**Table 2. Approximate age of onset of clinical symptoms of some representative chronic diseases**

Disease	Average age	Minimal age
Gout	40	6
Primary hypertension	32	9
Cardiac infarction	56	26
Rheumatoid arthritis	38	10
Laennec's cirrhosis	55	2
Multiple sclerosis	28	5

Certainly this belief would apply to those congenital diseases in which genetic factors are obvious. There are a group of diseases in which the hereditary influence is less clearly defined; nevertheless many observers hold that genetic factors play a role in such disorders as hypertension and coronary atherosclerosis, for example.

Be that as it may, recent additions to our knowledge support the opinion that the beginnings of a number of important chronic illnesses of middle and late life can be detected in early life (see table 3).

In some of the entities listed in table 3, it has been established that the early subclinical stage may exist for years prior to the development of overt clinical disease. Screening programs would detect the defect. When possible, preventive measures could then be brought to bear.

For example, the avoidance of obesity has been suggested as a useful primary preventive measure for siblings of diabetic patients. These recommendations are particularly advisable for such individuals when they have decreased glucose tolerance. The efficacy of a restricted carbohydrate diet in such patients to prevent clinical diabetes mellitus is now being explored.

Gamma globulin administration has proved to be a useful measure in preventing recurrent



sepsis in patients with agammaglobulinemia or hypogammaglobulinemia. Early casefinding is necessary if available preventive measures are to be instituted.

Primary prevention is not yet possible for most diseases listed in table 3, but early casefinding will serve as a stimulus for further investigation. Some measures already at hand have not yet been tested adequately. For example, since penicillamine has been reported to be an agent for the removal of copper from patients with Wilson's disease, it might be worth a trial during the precursory phase of hepatolenticular degeneration to prevent increased levels of copper in tissues and thereby possibly influence favorably the course of the disease. Furthermore, it would be of interest to learn the results of long-term probenecid administration in those siblings of patients with gout who have hyperuricemia. Long-term programs have been instituted to study the effect of mild antihypertensive drugs in individuals with a family history of hypertension and who have a hyperreactive arteriolar vascular tree.

The course of action is clear. Disease can be detected in some instances before chronic illness is clinically manifest, and widespread efforts to discover individuals in these subclinical stages of disease are necessary. Progress is being made in the development of measures both for primary prevention of disease and secondary prevention after the disease is evident.

**Table 3. Common precursory findings in some representative chronic diseases**

Common precursory findings	Clinical disease
Hyperuricemia.....	Gout
Cystinuria.....	Renal calculi
Decreased glucose tolerance..	Diabetes mellitus
Achlorhydria.....	Pernicious anemia
Agammaglobulinemia.....	Recurrent sepsis
Serum iron excess.....	Hemochromatosis
Pernicious anemia.....	Gastric carcinoma
Vascular hyperreactivity.....	Primary hypertension
Prenatal viral infections.....	Congenital anomalies
<i>Streptococcus hemolyticus</i> pharyngitis.....	Rheumatic fever
Silicosis.....	Pulmonary emphysema
Intestinal polyposis.....	Carcinoma of the intestine
Cystic fibrosis of the pancreas	Chronic respiratory infection
Heavy cigarette smoking....	Bronchogenic carcinoma

## Conclusions

Primary and secondary preventive measures for chronic diseases are being discovered and used with encouraging frequency.

Primary prevention is effective in such representative diseases as syphilis, tuberculosis, malaria, rheumatic fever, pellagra, amebiasis, certain forms of neoplasm, and a wide variety of illnesses associated with industrial agents.

Secondary prevention can be practiced to lessen the delayed pathology and disability which results from, for example, unmanaged or mismanaged syphilis, tuberculosis, rheumatic fever, pellagra, pernicious anemia, diabetes mellitus, and hyperthyroidism.

Epidemiological, clinical, and experimental studies on such matters as the relation of cigarette smoking to lung cancer and the role of dietary fat in human atherosclerosis are now opening possible avenues for prevention not commonly appreciated 20 years ago.

A critical review of existing knowledge indicates that in the great majority of instances the presence of chronic disease long antedates the appearance of clinical illness.

This is obvious in hereditary disorders. For example, hyperuricemia is present years before the appearance of clinical gout, and cystinuria exists long before the development of renal calculosis.

A similar "silent" or "latent" period exists in other long-term disorders (not commonly considered genetically influenced) such as hypercholesterolemia prior to the development of clinical atherosclerosis, heavy smoking before the appearance of bronchogenic carcinoma, pernicious anemia before the development of gastric carcinoma, and serum iron excess prior to the emergence of clinical hemochromatosis.

Although there is a wide range in the years in which chronic illness is first recognized, there is abundant evidence that careful clinical study will disclose the incipient stage of many chronic disorders at a much earlier age than is generally appreciated.

Since preventive measures, if available, exert optimum effects in the early and often reversible phases of chronic disease or illness, it is a matter of high priority to use preventive measures as early as possible.

## Public Health and Chronic Disease

THEODORE J. BAUER, M.D.

**D**URING the past 10 years the responsibility of State and local health departments to participate in control of the chronic diseases has been adequately established. During this period private physicians also have recognized their responsibilities to the chronically ill, and have made many notable contributions to early treatment and rehabilitation in order to lessen the severity of complications.

The most encouraging phenomenon during the decade of progress now ending has been the way in which private physicians and public health workers have accepted the fact that no definite means for preventing many of the chronic, noninfectious diseases has yet been developed. Instead of being discouraged or dismayed by this fact, teams of private physicians and health officers have turned to the practical task of extending activities and services designed to prevent or minimize disability in chronically ill patients and to prevent premature death.

A tremendous long-range research program has also been organized in this country, aimed at unmasking such secrets as the causes of cardiovascular diseases, cancer, and mental illness.

No one over 40 is free from some degree of disability caused by either an inherited weak link in the chain of organ systems or by the ravages of premature but otherwise to-be-expected physiological decline.

As Dr. Enrico Greppi, president of the International Gerontological Society, said at the fourth congress of the society, held in Merano, Italy (July 1957), "Old age can be considered a disease consisting of deficiencies and illnesses."

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Dr. Greppi estimated the average age of onset of this "disease" to be 45.

Since every individual then has a built-in "time bomb," which must cause his eventual destruction, it would seem futile to attempt to prolong "life" indefinitely, if by "life" we mean the mere act of existence. Instead, we should accept the physiological and theological premise that mortal life is meant to end and concentrate our primary attention on the prevention or postponement of disability. We should aim at maintaining as long as possible a productive state of adjustment to a necessarily imperfect existence.

This concept or approach to the problem of chronic illness frees us from the stultifying inhibitions unwittingly imposed upon us by perfectionists. Many types of cancer and heart disease are admittedly still incurable, but this should not slow down our efforts aimed at early detection of such diseases. We can help many by such work; we can help no one by refusing to undertake such work. Our duty is clear.

We can move ahead against the chronic diseases one by one now. We can move ahead now against that complex of chronic diseases loosely lumped under the heading "aging." We can apply now what we know about secondary prevention and rehabilitation, at the same time that scientists are pursuing their research into the fundamental nature of chronic diseases.

We are aware of the difficulties experienced by public health workers in State and local health departments in launching new programs. They are often handicapped by lack of funds, by lack of personnel, and by a lack of understanding of their problems on the part of the public, legislatures, and occasionally even physicians.

However, judging by the progress already



made in chronic disease control these handicaps can be overcome, perhaps slowly, but they can be overcome. That is the important thing.

The \$3 million increase in general health grants-in-aid to States, made available by Congress for distribution by the Public Health Service, is encouraging evidence that public recognition of the importance of the chronic disease problem has broadened. With these funds, health departments can begin demonstrating to the public the value of secondary prevention and rehabilitation. Once soundly conceived local projects are developed with Federal and State assistance, local citizens themselves will accept the responsibility for seeing that such projects are continued.

What types of projects can be started? Following are several examples that already are underway in certain States:

1. In one large midwestern city a substantial local appropriation recently was made to improve diagnostic facilities for children with rheumatic fever and to provide a mechanism for the antibiotic, prophylactic treatment of the disease to prevent the development of rheumatic heart disease.

2. In a large eastern State, the State health department has obtained chronic disease funds for local distribution. These funds, plus Federal funds, are being used to stimulate and partially support for 3-year periods a host of locally conceived projects such as screening programs in hospitals, establishment of rehabilitation services, development of home care or home nursing programs, diabetes detection, and alcoholism clinics.

3. In California, a local health officer is co-operating with the local welfare department and medical society in providing certain preventive medical services for persons who apply for old-age assistance. He is applying a modification of an old adage: "A penny for prevention is worth ten dollars for cure."

The list of such projects is almost endless: glaucoma detection, meals-on-wheels for home-bound oldsters, nutrition consultation for the chronically ill, and cytological screening examinations for cervical cancer.

We are aware that no matter how badly a local public health service is needed, no matter

how logical the service may appear to be, and no matter how tangible the benefits from such a service are, the service will not be accepted overnight. Adequate education must prepare for the introduction of such programs. The skeletons of many worthwhile local chronic disease projects litter the public health trail—the skeletons of projects which were offered to local people who were psychologically unprepared to accept them.

There is one worthwhile activity that State and local health officers can engage in which will tend to prepare people for new local chronic disease projects. It is an activity that is sometimes neglected in our haste to get projects underway. I refer to the need to determine on a communitywide basis the types of illness which exist and the quantitative and qualitative importance of these illnesses. Although it is widely recognized that the diagnosis and treatment of persons afflicted with a noninfectious disease is the primary responsibility of private physicians, nevertheless private physicians do not have the means at their command to determine public health priorities for a community.

It is true that the advice of local and State public health councils and advisory committees, in which private physicians play an important role, must be sought in establishing public health priorities. Still, the data collection and analysis upon which the establishment of priorities depends must be accomplished by the State or local agency designated to do this job, namely, State and local health departments.

Should a local health department determine, as a result of a community health analysis, that heart disease is the number one health problem in the community, then it would not only be logical but essential for the local health officer to present the problem of heart disease as he sees it, in all of its ramifications, to the local medical society. The health officer at that time can pledge the assistance of his staff to the local medical society in developing or administering any project they may agree upon.

Although the diagnosis and treatment of the patient with a noninfectious disease continues, as always, to be the primary responsibility of private physicians, the diagnosis and treatment of "community illnesses" continues, as always,

to be the primary responsibility of local health departments. This responsibility includes collection of significant data needed for public education leading to public acceptance of important new local health services.

The Public Health Service is proud to be able to work with State and local health departments in making the vital transition from the control of infectious diseases to the control of noninfectious diseases and accidents.

## FDA Screening for Unsafe Food Additives

Chemicals used in food processing must be proved safe by the industry before they can be sold for use in foods, under an amendment of the food and drug law enacted September 6, 1958.

Previously, the Food and Drug Administration had to prove such a chemical unsafe after the food was on the market and then bring court action to stop its sale.

Under the new law, which takes effect in March 1959, the manufacturer or promoter of the new additive must test it for safety in animals and submit test results to the Food and Drug Administration. If that agency is satisfied, it will issue a regulation specifying the conditions necessary for use. Those adversely affected by an FDA order may petition for a public hearing. An order emerging from such a hearing is subject to court review.

In addition to chemicals intentionally added to food, the law covers substances which may be expected to become components of a food or to affect its characteristics and which are not generally recognized as safe for their intended use.

For substances in use before January 1, 1958, and not generally recognized by experts as safe, industry has been given 18 months to present safety data in the absence of adverse evidence.

The law further prohibits additive use that would promote deception of the consumer or result in adulteration or misbranding. The amount of the additive fixed for use by FDA regulation will not be higher than the level required to accomplish the chemical's purpose.

The Food, Drug, and Cosmetic Act, enacted in 1938, when there were relatively few chemical food additives, required the Food and Drug Administration to discover the use of "poisonous or deleterious" additives in processed foods and to prove them injurious before action could be taken to protect the consumer. Since then, knowledge of food processing chemicals and the number of additives have advanced considerably. Testing of new additives by the Food and Drug Administration, normally requiring at least 2 years, became unrealistic in the face of a flood of new products both in use and under consideration.

Another aspect of the 1938 law was that any amount of toxicity sufficed to disqualify any chemical which could not be shown to be "required in production" or "unavoidable under good manufacturing practice." This was also unrealistic. Now the Food and Drug Administration evaluation of the safety of an additive requires considering among other factors the conditions of use, amounts used, and other related additives which may be used. As a result, many useful chemicals will be permitted if they are safe when used properly.

## Patient Services in Chronic Diseases

MARTIN CHERKASKY, M.D.

THE HEALTH and medical care resources and facilities generally available in our country were developed in response to the demands of acute illness. It is now inevitable and desirable that these same resources be directed toward the demands of chronic illness, which has become the main preoccupation of those in the public health and medical care fields. In determining the changes in philosophy and facilities which our medical resources must undergo to deal with this new problem, it may be worthwhile to contrast the characteristics of the acute illnesses which have occupied us in the past with those of the chronic illnesses which will occupy us in the future.

The most obvious characteristic of acute illness is dramatic onset. The healthy individual develops signs and symptoms such as sharp pain, high temperature, or coughing of blood which make clear to the patient, to the family, and to the physician that serious illness is present. In acute disease the length of illness is usually brief, most often measured in days, and the illness is marked by a crisp, definitive end point. Most often the patient makes a complete recovery, returning to good health and the activities, pursuits, and responsibilities which characterized his life before the acute illness. The characteristics of most serious chronic diseases are so different as to be almost the obverse side of the coin.

The onset of many of the chronic diseases is so insidious that often the individual will not clearly recognize that there is anything seriously wrong with him. There is no qualitative relationship between the presenting symptoms and the severity of the underlying disease.

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Diabetes is a very serious illness whose sequelae are disabling and often deadly. We are all familiar with the damage to the cardiovascular system which leads to heart disease, kidney failure, gangrene of the extremities, blindness, and other complications of diabetes, and yet it is commonly stated that more than a million Americans who have the disease are not aware of it. The reason is obvious; the initial symptoms may present such small deviations from the normal that neither the patient nor his family knows that anything is seriously wrong.

By definition the duration of chronic illness is measured not in days but in weeks, months, and years. Again in distinct contrast to acute illness, chronic disease usually does not have a sharp end point with complete recovery; more often disability and handicap remain for life.

The problems that face the individual, his family, and society in the care of the chronically ill are due to insidious onset, long duration, and disability.

### Medical Problems

To determine the kinds of hospital and related facilities required for the care of the chronically sick, we should closely examine the medical, nursing, and other areas of patient need. The view of chronic disease held by the general public and even by some physicians is colored by a number of misconceptions such as: chronic disease is indolent; not much can be done for a chronically sick person; the chronically sick can be cared for in lesser facilities; not as much or as high-quality doctors' care is needed for the chronically sick as for the acutely sick; the most costly and complex resources are needed by the most acutely sick and



not by the chronically sick. These views lead to the greatest misconception of all—that good care for the chronically sick is cheap.

These erroneous impressions have arisen because we have tried to lump together all chronic disease in the same way that we generalize about all acute disease. The difficulty lies in the fact that, for medical care purposes, acute illness has only one stage while chronic disease has several. These are, first, the active or acute phase which requires definite diagnosis and the application of definitive therapy, and, second, the rest of the natural course of the disease.

When we discuss medical care needs, facilities, personnel, and costs we must specify whether we mean the active, acute, first phase, with its great demands for highly skilled physicians and many other professional and technical people and resources, or the second phase, with its lesser demands on facilities and personnel and, therefore, lower cost.

When a chronic disease hospital has low per diem rates, 1 of 2 circumstances prevail: if the patients are really sick enough to require hospital care, then they are not getting the kind of medical care they require; if the patients are getting the care they need at this low cost, then their needs must be primarily nursing or custodial, and the use of the term "hospital" is misleading. High-quality, intensive hospital care for the active phase of chronic illness costs at least as much as care for the acutely sick. The reason is clear. In order to determine or apply definitive therapy it is necessary to establish an accurate diagnosis. The diagnosis of chronic illness requires the most complex laboratory facilities, the widest range of procedures, and the most difficult and expensive X-ray examinations. For example, the X-ray procedures for diagnosing lobar pneumonia and fractures of the long bones are simple compared with those necessary to diagnose a congenital abnormality of the heart or a tumor of the brain.

Diagnosis, particularly in older people, is also difficult, because often more than one important diagnosis is involved. It is not uncommon that a patient with a tumor of the bowel may also have atherosclerosis, hypertension, or other such complications.

The same complexity prevails in the application of definitive therapy. When a healthy person is suddenly struck down with an acute illness, the treatment is often obvious, and the patient's undiminished resources can be relied upon to help him through the period of acute stress and illness.

But a patient with chronic disease is likely to be older and more debilitated and beset by complicating conditions. For example, operating for carcinoma of the bowel on a patient in his fifties or sixties requires particular care in the use of anesthesia because the patient's vital capacity may be less than it once was. His heart and blood vessels are not as supple as they were, and this must be considered when it is necessary to replace body fluids. Injudicious use of blood and fluids can lead to acute heart failure in a patient undergoing such major surgery.

In our experience at Montefiore Hospital with the complicated surgery needed by patients with chronic disease, whether it be surgery of the lungs, abdomen, or heart, we find it essential that physician anesthetists be used because such operations are always difficult and the patient's hold upon life is so delicate.

The need for the most expert skill applies equally to the surgeon, the internist, and everyone in the specialties and subspecialties of medicine. Chronic disease batters and beats its victims. All too often we first see the patients when the disease is well along, or on a second or third or even tenth or twelfth hospital admission. Their persons, their tissues, their spirits must be handled by the most gentle and the most proficient.

The requirements of great skill also extend to nursing. Without good nursing, a patient with a neurological disease or a fractured hip can become a patient with bedsores or infections which threaten his life or at least his well-being. The nurse's responsibilities include maintenance of the patient's nutrition, carrying out complex treatments, participating in the rehabilitation of the patient, utilizing the special relationship to encourage the patient in the difficult adjustment to serious illness, and many more such vital tasks. These make the care of the sick, debilitated patient with

chronic illness the greatest challenge that nursing, with its skills, understanding, and compassion, has ever been called upon to face.

### **Readjusting**

A serious difficulty accompanying long illness and disability is the impact of the illness upon the patient's relationships with his family and with society. Most families do not have either the financial or emotional resources to withstand the onslaught of chronic disease without help. We must recognize that chronic illness not only tends to pauperize our families but also has a destructive effect upon the family structure. Therefore, we must deal with the personal and familial emotional and social aberrations which accompany every serious long-term illness.

Here is a typical example of these difficulties. A 50-year-old man, the head of a family and the breadwinner, develops abdominal symptoms, goes to the hospital, is operated on, and is found to have a cancer of the bowel with some spread. This man not only has his life threatened by illness, but after his period of hospitalization, he is going to be handicapped and ill for the remainder of his life. Instead of being the leader and provider he will have to be cared for and provided for.

This is not only a personal catastrophe, but a catastrophe for the entire family. His wife has to assume responsibilities which he formerly bore. His children, for whom he had great hopes and aspirations, can no longer continue with their schooling but must help the family in its difficulties. One day he is a father, husband, leader, producer, giver; several weeks later the entire social structure built up over a long period of time has been shattered.

Anyone who has cared for the chronically sick has seen patients whose greatest lack of well-being, whose suffering and discomfort came, not from the physical pain and the illness which might ultimately destroy them, but from the disordered situation which the illness has produced within the family.

We physicians concerned with hospital and medical care cannot narrowly define our responsibilities as we might like to. We must define our responsibilities to fit the patient.

Since the social and emotional effects of long-term illness are vital to the well-being of the patient, the family, and the community, we must concern ourselves with this kind of problem just as effectively and aggressively as we do with organic medical problems. The social worker with her special training and skills can effectively join with the physician to meet this important patient need. The general hospital will have to broaden its philosophy and resources to deal with this aspect of illness.

Special skills are needed in medicine, physical medicine, psychiatry, social work, nursing, vocational rehabilitation, speech therapy, and many other areas to enable the patient to make the maximum use of his remaining physical, mental, and emotional resources. This concept of patient care has recently gained recognition. Every general hospital, nursing home, and home care program should undertake the rehabilitation activities appropriate to its patient population.

Among the many other activities that we must undertake in caring for patients with chronic illness is occupational therapy. This can be a very important tool if it is utilized in an intelligent manner and is integrated with other medical care. It is sad to realize that the first extended period of leisure which some people have ever had has been enforced by serious illness. In our own experience we have found that skilled occupational therapists, warm, interested, and willing to find out what kind of person the patient is, what his interests are, and the directions in which his talents or desires lie, can help patients to find the well-springs of creativity which exist within so many people unknown to themselves or others. This discovery adds a new dimension to the sick person's life and makes him feel productive and worthwhile.

Other services, such as recreation, vocational training, counseling, and job placement, are also required.

### **Community Program**

In all communities we face the need to modify, change, and add to existing resources, facilities, and services so that we can adequately serve the chronically sick. I recommend that



you who are concerned with planning for the care of the chronically ill in a community close your eyes and dream this dream: Your community has no facilities for these people, and you can have any you believe necessary.

We all know that we will wake to the reality of facilities in the wrong place or of the wrong kind, and we must work and live within this reality. However, this exercise of imagination has concrete value. It is essential that the planners in every community have a blueprint, a dream, in keeping with the town's own cultural characteristics, needs, and resources, to show them where they should be going. Then as opportunities present themselves, they can move toward this ideal with a logical, planned program.

What are the facilities a community needs to care for the chronically sick?

1. A good general hospital with a broadened philosophy, providing not only doctors' care and nursing service but the services of social workers, and facilities for recreation, rehabilitation, and occupational therapy. In this hospital patients are not classified as acute or chronic but are cared for as their needs match the hospital's resources.

The hospital patient is a patient who requires definitive diagnosis and definitive therapy. Any patient who does not fit these criteria must be cared for elsewhere. This practice will insure that the hospital bed is used for its stated purpose. In effect hospitals should be, in toto, intensive care units. This can be brought about only by providing other institutions to which patients can be transferred when they need medical and nursing care less extensive and intensive than that provided in the modern general hospital.

2. A home care program for those patients who still require medical, nursing, and related care but who no longer require the specialized resources of the hospital. In the Montefiore Hospital home care program we have, by design, selected only patients who are quite sick, and for them we emphasize the role of the physician, the nurse, and the social worker in caring for them. We have recently undertaken, in conjunction with the Beth Abraham Home, a custodial institution, a somewhat dif-

ferent type of home care program for custodial patients. The emphasis and major cost of this program center around housekeeping and homemaking services rather than doctors and medical care.

3. The nursing home, preferably on the grounds of the hospital and certainly under the hospital's auspices for medical care and medical care supervision. This is a facility where patients, after completing the active phase of hospitalization, stay for days or weeks and receive the nursing care and, it is hoped, the aggressive rehabilitation designed to return them to the community.

4. A custodial institution for people who no longer belong in a hospital and yet cannot be cared for at home because of disabilities, handicaps, or social situations. This institution emphasizes nursing care and meets the daily needs of severely handicapped people. It would be desirable if it were on or near the hospital grounds, and certainly its medical care program should be under the supervision and direction of the general hospital.

5. An adequate outpatient department for those people who are sick but who can travel from their homes to the hospital. This activity should provide the kind of medical supervision and attention which will not only treat the immediate medical problems of these people but also will tend to keep them out of institutional facilities.

## Summary

Chronic disease in its active, acute phase requires the high-quality, complex diagnostic and therapeutic facilities of the general hospital. Beyond this phase lies a varying period when lesser but continued medical, nursing, and related care is needed. A home care program, an outpatient department, a nursing home, and a custodial institution, preferably on the hospital's physical premises but certainly under its auspices, are required to meet these needs. Such broad responsibility should be assumed by the hospital because its medical and related resources are organized and available in a manner that can rarely be duplicated by lesser medical care facilities.

## Health Related Services

OLLIE A. RANDALL

**T**HE FACT that health-related services is a topic at this symposium is tangible evidence that among those concerned with health there is recognition of the fundamental kinship of health services and those services more commonly regarded as social or economic in purpose. This is a long step forward toward the time when the health and welfare of a human being and of the public of which he is an integral part will be literally indivisible.

This is not to deny that there are sicknesses of the body and mind that arise from physical causes accidental to or inherent in the environment. To trace and correct these causes is the traditional concern of public health personnel. However, sicknesses arising from social situations created by an uncongenial environment are more prevalent than ever before and have little direct relationship to the traditional focus of public health service. If we endorse the premise that the community's level of health can only be accurately measured by rating the level of health of each of its members, then the correction of socially induced illnesses becomes a logical matter for the attention of those developing or administering public health programs.

If this premise is sound, the real questions are how and through whom these economically and socially induced illnesses can be discovered and corrected. Since the basic unit of our work is the human being, the general current thinking (but not current practice) sug-

gests that treatment of the whole man is essential to the attainment of desired results or their nearest approximation, according to the means at our command.

It is perhaps trite to comment that the complexity of organized society, and the rapidity by which that complexity is constantly being compounded, is often at the root of the individual's difficulties. It is even more trite to point out that well-directed and well-balanced teamwork is required if the interrelationship of these services and interests is to be demonstrated.

The team which comes into existence through our accepting the concept of a close relationship between social and health services consists of health and socioeconomically trained personnel, and, incidentally, the individual and his family. The task of the professional members of that team is to bring together as best they can the skills of the participants whose specialties have been splintered from the originally comprehensive and central core of treatment.

With the growing number of specialties in health and health-related fields, it is no longer possible for one person to be equally well versed in all of them. But it is possible to be aware of the potential that resides in their combination for preventive and better patient care and for public health. Without merging skills, the potential is obscured or lost.

In our day, it is the chronic or long-term illness or invalidism induced by such illness, with its health, social, and economic ramifications, that professional medical personnel are called upon to diagnose, understand, and treat. This may call for further specialization, but, if

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others are to understand his results, it also calls for an "ungrooving" of the specialist.

### **The Health-Related Fields**

In the broadest sense, anything that enables an individual to maintain a satisfactory level of health may be considered health related. It is advisable at this point, however, to limit discussion to economic and social services that are quite obviously health related and that can be readily integrated with those personal and family health maintenance programs that form the true basis for the public health of the community.

Counseling and group work, employment after retirement, housing, and community organization are vitally important health-related services, but two important factors underlie all of them in our approach to better public health.

One of these is education of the public, especially through adult education, without which forward movement in each specific service would probably have been much slower than it has been.

The other is our country's means of providing income through employment and through its social security system. Private and government enterprise seeks to enable the individual by means of his own resources to assume the responsibility of his own health and his family's, even through the lean years of retirement.

### **Social Security Programs**

Conditions of employment, including the wage level of the general population, play a distinct role in maintaining the health of workers and their families. These conditions are tempered by the degree to which workers appreciate their health needs since for many health is a strictly personal matter. This is another way of saying that money without understanding of how it can best be used is not enough.

It is increasingly apparent that management and labor are sensitive to the impact of working conditions upon the health of workers, over and beyond the safety measures that are ad-

mittedly health related. The growing concern about industrial health and about plans for services to reduce the costly inroads made by chronic illness on productivity indicates the direct relationship between jobs and economic and individual health.

This concern is most practically expressed in the partnership of government, business, and industry in the Nation's social security programs. These undeniably provide the most effective bulwark we have in maintaining the health of workers and retirees. The achievements by 1957 of the past generation in social security can be looked upon with justifiable satisfaction, even pride, by everyone. The interdependence of privately and publicly supported programs of economic and social security and public health programs does not require elaboration, although voluntary agencies may overlook at times the fact that their selectivity is possible only because the public services are in operation.

It has been said that the public assistance program is one of the best means of finding cases of acute or chronic illness. This is probably true of both the disability and the old-age and survivors' insurance phases of social security, although their lack of direct social service may make casefinding a somewhat minor component of the program.

The beneficiaries of these services have as a rule low or marginal incomes. A large majority of them are middle-aged or older people, and they are ready victims of illness. Until there is a closer working relationship between security programs and community health services (both voluntary and public), we shall not realize with sufficient understanding that for children and older adults inadequate living and health facilities are sources of the increasing incidence of chronic ailments. The income of the older adults usually fails to provide proper housing, decent environment, proper nutrition, or adequate medical care when and as needed. It may be truthfully said, however, that more is done in providing medical treatment than in underwriting the other factors that might help to prevent the present, extensive need for treatment.

The results of huge expenditures of scientific effort and funds for the development of the



Salk vaccine were dramatic; it would be wonderful if there could be an equally dramatic demonstration of what similar amounts of money and scientific effort might do to prevent or minimize the high incidence of malnutrition. Thousands of malnourished children and older adults are susceptible to acute or chronic disease, but exist on assistance grants and insurance benefits that, with all the will and skill to spend wisely, are just not enough to encompass their health needs.

With the new national public assistance grants that permit some States to take advantage of funds to provide more adequate medical care for recipients of public assistance, there will be spotty improvement. But with low levels of basic assistance in many areas, little more will be accomplished than *ex post facto* treatment. Strong bodies that resist more readily the inroads of acute or chronic illness will not be built. The program, moreover, will not help the beneficiary of social insurance whose funds are sufficient to make him ineligible for even consultation regarding his health needs, but are insufficient to enable him to pay for proper care. What is vital in all this is the growing opportunity and necessity for teamwork among the arms of public services at every level of government and among official agencies and voluntary social and health services at the local level.

Money, or the lack of it, is only one factor in the health situation. Hence the Public Health Service's development of the Chronic Disease Program offers a service of tremendous value that public and voluntary social agencies should promptly seize upon. The present possibility of educating the public about the known causes of illness, the effects of untreated illness, and the wisdom of taking advantage of the vastly improved knowledge of illness is without past parallel in most communities. It is a matter of record that lectures and discussions that attract the largest number of adult listeners and interested participants pertain to health and the prevention or treatment of illness. Matters of income maintenance run a close second. The necessity of learning to protect health and income is engaging more of the time, efforts, and funds of private persons and organized groups than ever before.

Individuals and social agencies, however, need a better understanding of health and illness and the effect of the latter on their work. Health agencies have a similar need to understand the meaning of individual attitudes and family culture and their impact upon physical and mental health.

Informal and formal groups offer an unusual opportunity for the dissemination of health information; the phenomenal growth of adult education programs should be taken advantage of without delay.

### **Counseling, Casework, and Group Work**

In recent years the direct personal relationship between an individual and the social worker whose primary concern is the well-being of that individual has also gone through some changes. It is now divided into two phases: counseling and casework. This development seems to imply that counseling is either the threshold for casework or a rather diluted form of the intensive process that characterizes casework. Whether or not this is an accurate analysis, we find more and more people, particularly the middle-aged and older people, seeking "counseling" on health matters in all kinds of service agencies. Much more must be done in training and in the development of mutual understanding between health and social services if such counseling is to be sound.

Group work, in social service, helps people adjust to each other by coming to grips with their needs as they are modified or aggravated by the needs of others and by obtaining individual satisfaction through group action. With older people, this phase of social work is used extensively, with varying success, in "golden age" clubs and in day centers.

In counseling, casework, and group work it is essential to know the person as he is in a variety of settings and relationships (as a family member, worker, and citizen at large), and as he thinks he is. There can be a real difference between the two.

Of all the settings, the most important is the home; for here attitudes about health as about other matters originate. As living becomes more and more complex, as the firmness of family ties yields to some of the stresses and

strains created by this complexity, some glimmer of understanding of these attitudes becomes an essential component of health and social security programs.

If as one delegate to a governmental session forcefully commented, "Try to get a doctor to go to the home of an old chronic! It's pure nonsense to talk about it. Doctors just don't and won't go!" If this is true, whatever the reasons, doctors must come to depend on teamwork with social workers and public health nurses. For their success in working with people derives from a clear and sometimes intimate acquaintance with physical, psychological, and economic conditions in the home.

Today the public health nurse is the professional person most frequently visiting the home of chronically ill people. Generally, she is the one who is most welcome because of her easily understood and readily accepted service. If ways can be found to use her special skills at the outset of counseling, casework, or group work, we are more certain to find, as we have in the agency with which I am connected, that as health problems are minimized or resolved social situations have a way of being resolved or of resolving themselves more quickly.

Much has been said and written on the preventive aspects of group work in clubs and day centers with older people. Perhaps some of these claims can be substantiated. Experience, however, cogently indicates that professionally directed clubs and centers are seriously handicapped and limited unless they have direct ties with counseling, casework, or health services. The handicap stems usually from the need for help on physical and mental health problems; the staff is often unable to advise these people or to refer them correctly.

All this seems to point to the necessity for a greater emphasis on the physical and mental health aspects of social work, particularly in the family and group work agencies, and a greater emphasis on the social aspects of health work for health personnel.

As some of us watch service programs for older people, of whom many are handicapped by chronic illness or invalidism or are likely candidates for similar handicaps, the need for a working liaison between the branches of "comprehensive care" is distinctly highlighted.

With the current shortages of trained personnel in all fields of service, probably the most we can expect or ask for is that the desirability of such teamwork be recognized through the appointment of consultants from the field of health in social agencies and from social services in health agencies.

### **Postretirement Employment**

If we consider postretirement employment desirable, we must find some way of making employers and employees aware of the working conditions that are conducive to maintaining health at a level necessary to meet the requirements of the daily job. We must also learn more about an individual's health potential so that we may look for positive possibilities of employment. If it is a fact that we are reaching our later years in better health than our fathers or their fathers did, let us hope that health personnel can help us capitalize on this fact through the employment of older and retired workers.

There is at present a vague, but probably not baseless, notion that with better financial underpinning of retirement, older persons are less apprehensive about it and more willing to accept it, especially if retirement has been planned for. But we have a long way to go before retirement is fully welcomed and an equally long way to go before it is sufficiently underwritten to overcome the need many older people have of working mainly for the money they can earn, regardless of psychological or social motivation.

Society must also cope with the "right to work" at any age, for the worker's sake and perhaps for the sake of society as a whole. This topic is so controversial I shall only comment that any employment program for the elderly must be closely allied with a constantly watchful health program of prevention, treatment, and restoration. The last of these has not so far been as readily available to older people, either workers or nonworkers, as actual circumstances warrant.

Whereas older people are exceptionally vulnerable to the consequences of acute disease, we are finding they are also capable of an encouraging degree of restoration if given the benefit

of rehabilitation. Hence an unbiased partnership among management, labor, employment counselors, and health agencies assumes high priority for employment practices in the period currently designated as "retirement years."

### **Housing**

Where and how people live unquestionably helps to determine the status of health they can maintain. The public health services have long been engaged in evaluating the sanitation and environmental factors which adversely affect health. Their concern not only for those facilities designed to house special health services but for housing accommodations in which people live assumes greater validity as more people, especially the chronically ill, continue to remain at home when sick.

If we take only the fact that about 95 out of 100 older people live in their own homes, either alone or in families, and relate that to the fact that the proportion of persons limited by chronic ailments is higher in the upper age brackets, it is not difficult to estimate the importance of any program of home health care and the attention that must be paid to the appropriateness of the home itself.

Whereas good family relationships are fundamental to propriety, the actual physical accommodations and their proximity to available services should be given equal consideration, whether the housing is under private, quasi-public, or public auspices. Principles of architectural design such as public health agencies propose for health facilities to reduce hazards and to be useful even for those with orthopedic handicaps may be applicable to private housing.

Certainly, in any large multiple dwelling as well as in individual homes accommodations that enable the chronically ill to remain at home have economic and social values that appear to merit serious thought.

The advice and help of health personnel are, or should be, an integral factor in such planning. As we look ahead to more extensive public housing programs for the elderly this becomes self-evident. But most conferences bog down on questions relating to the services and kinds of living quarters that are desirable and functional for the elderly under changing

health circumstances. It is not a question of what, or how much of what, should be included in proposed or future housing plans for adequately accommodating the sick or infirm; we are confronted with the immediate issue of what should be done for those who have lived in housing developments long enough to be now among the aged. The housing and the tenants have aged together.

### **Community Organization**

As we consider the community in which the chronically ill live and realize how great the gap is between facilities, services, and our knowledge about who the chronically ill are and what their demands are, it is easy to become discouraged.

Yet there is a trend (and perhaps the needs of the chronically ill are partially responsible) which is quite encouraging. This is the movement for the gradual merger of health and welfare planning agencies. Citizens are showing greater interest as more and more families are faced with problems for the solution of which neither services nor facilities exist, to say nothing of funds.

In these community movements there is a new realization that no single group in the community can be exempt from participation in both planning and action. Management and labor and professional personnel from all governmental and voluntary agencies and disciplines, including the church, and interested laymen will all be involved since all are directly affected. There is still the troubling tendency to specialize in disease entities or in groups defined by age and other distinctive characteristics, but even in specialized agencies (for example, the heart associations and commissions for the aging and aged) there is an intense awareness of the need for being a part of the local, State, and national communitywide approaches to the prevention and control of chronic illness.

Another encouraging sign is the trend to bring together, at least as affiliates, the various institutional programs of diagnosis, treatment, and restoration that serve the chronically ill. It will be still more encouraging when social service agencies are more definitely coordinated with and are promoting this type of affiliation



whose major objective is better service to the individual. Ultimately these measures should improve the quality of care in institutions as well as in homes, when the home-care programs are expanded.

As one observes the changing purpose of hospitals and homes for the aged and the changes in the actual use of them (nursing homes, for example, are now established as a part of the community's medical care facilities), one has

an almost overwhelming sense of the immensity of the task of community education and organization that lies ahead before we find the chronically ill patient in the right place at the right time.

Sincerely interested leadership promises a brighter future, especially if all the "relatives" of the health field join with it in order to work toward an earlier approximation of the goal of comprehensive health care.

## Medical Research Expenditures in 1970

Expenditures for medical research in this country can and should be tripled to reach a billion dollars a year by 1970, a group of special consultants to the Secretary of Health, Education, and Welfare said in a recent report.

The special consultants, 10 prominent medical educators and industry research executives, were appointed in 1957 by the Secretary to advise him on long-term needs in medical research and medical education. Dr. Stanhope Bayne-Jones, formerly dean of Yale University School of Medicine, was chairman.

The consultants warn, however, that such an expansion of medical research will require a major increase in the number of physicians and other scientists—from 20,000 now to 45,000 in 1970. To make possible this increase in research staff and at the same time to provide a sufficient number of physicians to give adequate care to the expanding population, additional educational facilities will be needed, they indicate.

According to present estimates, there will be only 19,000 additional physicians and scientists for medical research during the next 12 years, 6,000 short of the estimated 25,000 additional workers needed, the report states.

The consultants believe that "it would not be in the public interest for the number of physicians in the Nation to fall below the ratio of 132 for 100,000 persons." This ratio has remained fairly constant over the past 30 years.

To maintain this ratio, they assert, would require construction of from 14 to 20 new medical schools at a cost of between \$500 million and \$1 billion. This expenditure for medical school construction would be on a much larger scale than has heretofore been contemplated.

As the consultants point out, however, even if these large funds are made available immediately, the ratio of physicians to population will fall before 1970 because of the usual lapse of 10 years from the time a school is planned until the first class is graduated.

If the Federal Government continues to provide about half of all funds for medical research, Federal expenditures would increase from \$186 million in 1957 to approximately \$500 million by 1970, the consultants estimate. Industry's share in 1970 would be more than \$300 million, and contributions of private philanthropy would amount to \$100 million.

# Signs

and

# Symptoms

A 2-day orientation course in atmospheric pollution presented by the University of North Carolina at Chapel Hill in cooperation with the North Carolina State Board of Health has kicked off the State's first clean air inventory. A 6-month statewide study will be carried out under a Public Health Service grant.

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New York State Health Commissioner Hilleboe last July asked the State Attorney General to bring legal proceedings against more than 700 hotels and camps that had not obtained permits to operate. Under the law, a sanitary permit is required for every "temporary residence" in the State.

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Almost 3,000 physically handicapped workers are employed by the Department of Health, Education, and Welfare, in a total payroll of 53,000.

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Dr. Leonard Greenberg, New York City's commissioner of air pollution control, urges city motorists to maintain vehicles so as to combat visible exhaust smokes. A leaflet on the subject, prepared by his office, can be obtained from the Department of Air Pollution Control, 15 Park Row, New York 38, N. Y.

« »

Two amendments to the New York public health law require that firms and institutions apply to the State health department for permits to deal in, or dispense, narcotics after July 1, 1958. Each licensee is required to pay a \$25 fee, and to register biennially starting April 1, 1960. Hospitals, laboratories, and dispensaries must pay \$10 fees and are also subject to biennial registration.

Highway accidents are gaining recognition as the principal cause of death and disability among migratory agricultural workers.

The Toledo, Ohio, Diocesan Council of Catholic Women has prepared and distributed a 2-page pamphlet in English and Spanish on safety suggestions, based on the new ICC regulations.

Migrant workers may operate their out-of-state registered motor vehicles in Maryland for extendable periods of 90 days provided they first obtain a permit from an office of the Maryland Department of Employment Security and conform with other requirements regulating the use of vehicles transporting seasonal farm labor, the distance between crop and destination (not to exceed 35 miles), and the insurance coverage of vehicles (minimum of \$10,000-\$20,000 PI and \$5,000 PD).

Pennsylvania's transportation regulations, similar to the ICC's, require owners of out-of-state vehicles used to transport seasonal crop workers to obtain a special permit. Vehicles must also be officially inspected.

« »

An all-out program of home inspection by fire departments would cut fire deaths as much as 50 percent, according to Percy Bugbee, general manager of the National Fire Protection Association. There were 6,405 accidental deaths by fire in the United States during 1956.

« »

In 1900, according to the Health Information Foundation, nonwhite infants could expect to live 33 years. By 1955, their life expectancy increased to 63.2 years, still 7 years less than the average for whites.

More than 25,000 copies of the leaflet, Food Facts vs. Food Fallacies, have been distributed since it was prepared in April 1957 for the Department of Health, Education, and Welfare to warn against quackery in nutrition.

« »

Three demonstration projects in Indianapolis, Kansas City, and Cincinnati will show what can be done in the above municipalities for those with "personal adjustment problems which prevent them from maintaining employment." The Office of Vocational Rehabilitation is paying the bulk of expenses.

A project at the Indianapolis Goodwill Industries gives preference to physically disabled persons with emotional problems. Goodwill and the Indiana Mental Health Association will share \$50,000 cost for the first year of a 3-year program.

« »

A series of publications on air pollution, poisoning, and library resources have been issued by the division of occupational health, Texas State Department of Health, in Austin. Their titles are:

Ordinances and Legislation Related to Air Pollution, OH-20, December 1957; Current Trends and Approach to Air Pollution Problems in Texas, OH-20A, January 1958; The Problems and Effects of Air Pollution, OH-20B, January 1958; Communities and Counties in Texas Where Accidents Involving Use and Transportation of Atomic Materials Might Occur, OH-25, April 1958.

Poison Control Centers: Recommended First Aid Measures, OH-24B, June 1958; Poison Control Centers Located in Texas, OH-24A, June 1958; Economic Poisons Currently Recommended by Texas Agricultural Extension Service, and Organisms Against Which Recommended, OH-6-1 (superseding OH-6), March 1958.

Important Economic Poisons, OH-5-1 (superseding OH-5), March 1958; Poison Control Centers: Toxicology Information, OH-24, April 1958; and Occupational Health Library, OH-19-1 (superseding OH-19), April 1958.

*A refined method of estimating numbers of future births, based on age-parity specific rates, is used to obtain two series of birth projections for the period 1956-65.*

## Short Range Birth Projections

JOSEPH SCHACHTER, B.B.A., DEWARD E. WAGGONER, Ph.D., and PASCAL K. WHELPTON, B.A.

**E**STIMATES of the number of births that will occur during the next 10 years are of considerable importance for effective program planning in areas of public health, social welfare, economic activity, and community facilities. In response to the need for such data, various methods have been developed for estimating the number of future births on the basis of alternative assumptions as to fertility trends. These estimates are generally called projections. While they do not purport to predict the future, projections are usually designed to provide alternative birth series representing the range of reasonable possibility. A large element of judgment is, of course, involved, but a knowledge of fertility trends and an understanding of the current demographic situation are basic factors in the quality of the results.

Of the various methods for making birth projections, the one most widely accepted uses age-specific birth rates to measure fertility (1, 2). This rate is defined as the number of births to mothers of specified age per 1,000 women in the corresponding age group. Time

series of these fertility rates are extrapolated on the basis of alternative assumptions as to future trends. A parallel series of estimates of the projected female population in the reproductive ages is obtained by "aging" the present population the required number of years and adjusting for anticipated mortality and net immigration. The projected rates are then applied to the projected numbers of women to derive estimated numbers of births.

A logical refinement is introduced into the foregoing procedure by the substitution of the age-parity specific birth rate as the fertility measure. This rate is a birth probability, having as its denominator the number of women of specified age at the beginning of the year who are subject during the year to a birth of specified order. The numerator represents the number of these women who experience a birth of this order during the observation year. Thus the age-parity rate identifies the female population at risk of pregnancy not only in terms of the women's ages but also the order of birth to which they are subject. The age-specific rate, of course, does not take explicit account of this latter variable.

In the proposed method of projection the birth probabilities are extrapolated and applied to successive cohorts of women classified by age and parity. The end product is a series of birth frequencies classified by single years of age of mother and by birth order. We have applied this procedure experimentally to obtain two series of birth projections for the period 1956-65, based on available fertility data

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through 1955 and on alternative assumptions as to future fertility. All birth data are adjusted for under-registration.

#### Projection Series A

Age-parity specific birth rates for the period 1950-55 were furnished by Whelpton, together with figures showing the estimated distribution of the female population as of January 1, 1955, by single year of age and by parity. These data and a detailed discussion of their nature will be presented in his forthcoming fertility monograph, which revises and expands an earlier publication on the subject (3). The birth rates were formed into time series for each age-parity group and examined to determine their trends in recent years. There were about 240 such series, some of which are illustrated in figure 1. In general, the trend showed an upward movement during the 6-year period but at a declining rate.

#### Fertility Assumptions

For extrapolation purposes, various assumptions could, of course, be made as to the future direction of fertility trends. A reasonable possibility, however, was that these curves would level off by 1960 and remain at that level until 1965. This hypothesis formed the basis for series A, the first of two illustrative projections. A second series, series B, was also prepared, based on the assumption that the 1955 age-parity rates would remain the same in each of the years 1956-65 (fig. 2).

To apply systematically the fertility assumptions underlying series A, a second-degree equation was fitted to the 1950-55 age-parity rates, the curve of which would satisfy the following conditions:

1. Form a least-squares fit to the data for 1950-55.
2. Pass through the arithmetic mean of the 1954 and 1955 rates at the ordinate midway between those for the 2 years.

Figure 1. Age-parity rates for third births to women 25-29 years of age, United States, 1950-65.

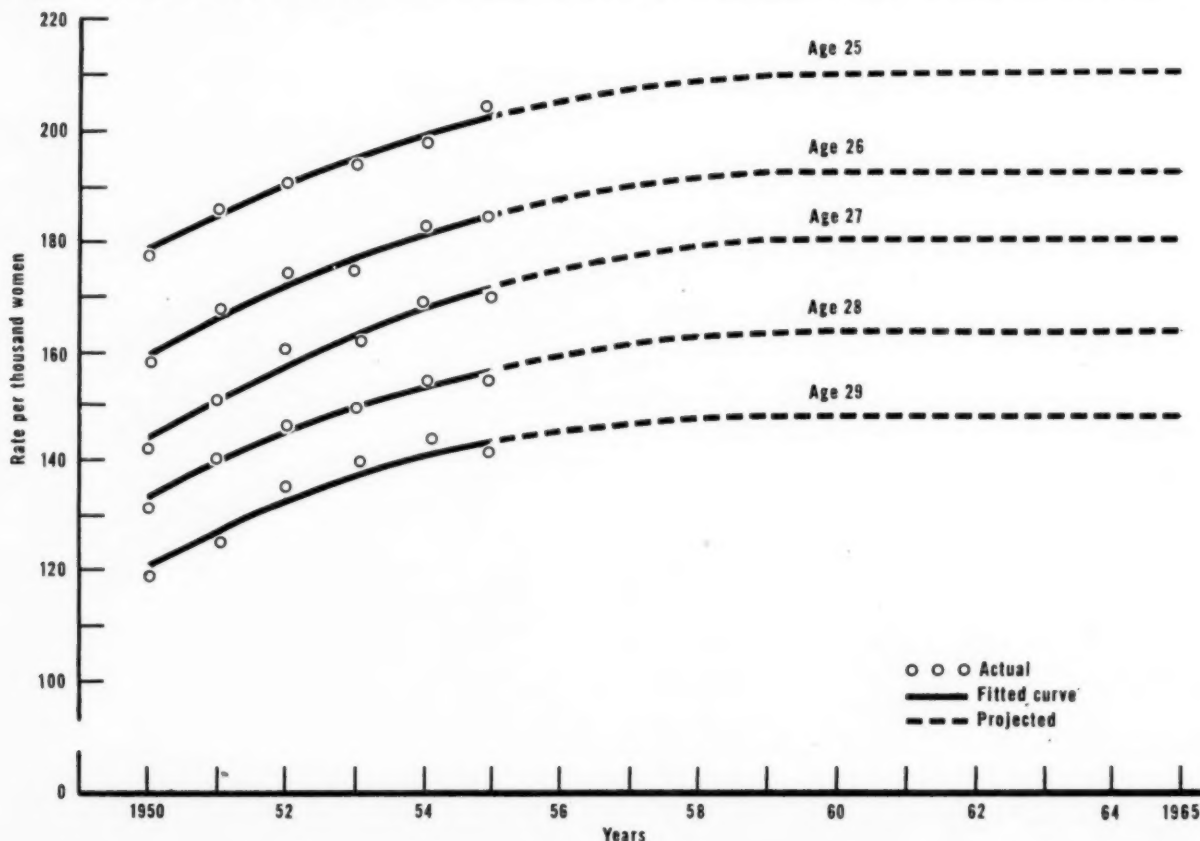
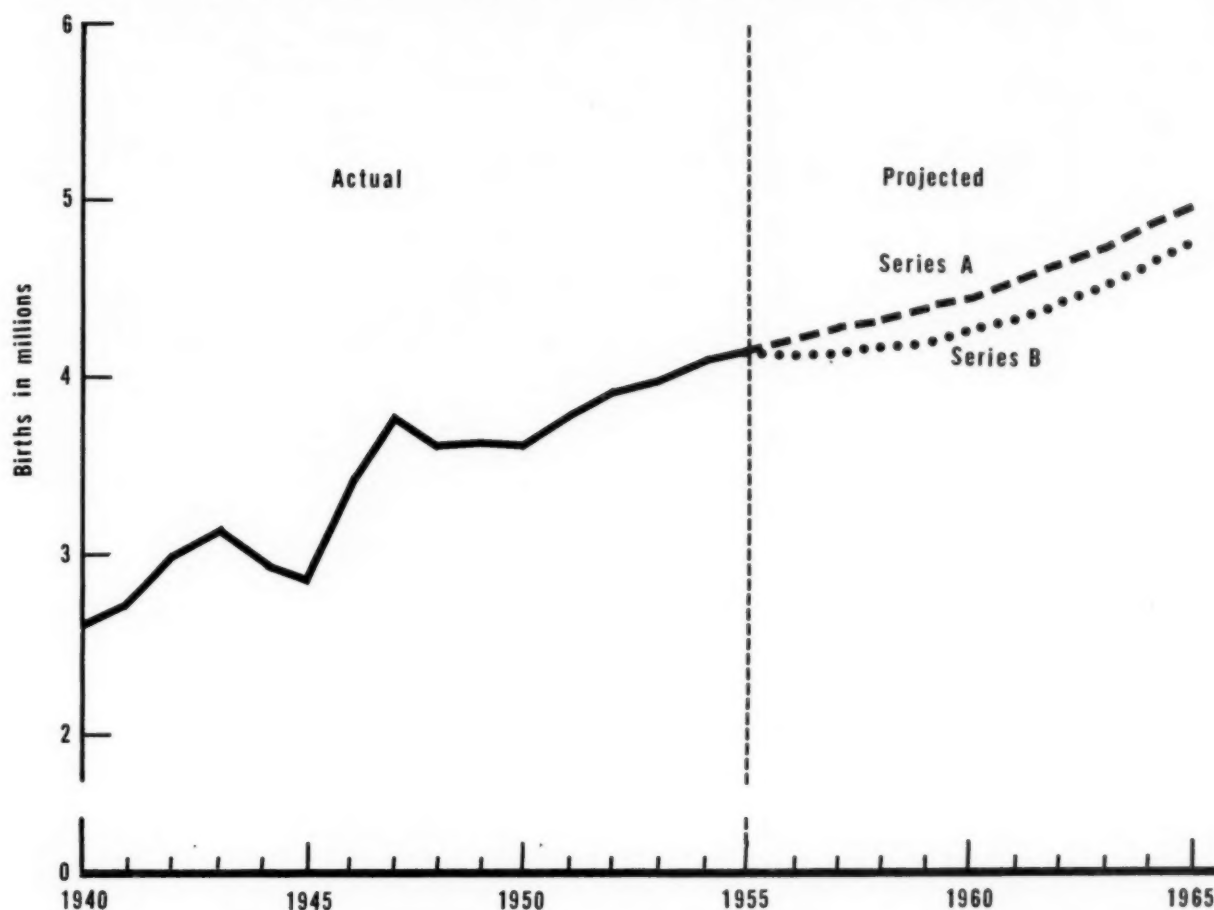


Figure 2. Actual and projected numbers of births, United States, 1940-65.



3. Have a slope of zero in 1960.

The following general equation was used to fit the curves to each of the series of observed data:

$$v_x = ax^2 + bx + c$$

where  $v_x$  denotes the computed rate corresponding to the abscissa  $x$  (year-1950). Here  $a$ ,  $b$ , and  $c$  are constants to be determined for each series in accordance with the conditions previously stated, which lead to the expressions:

$$a = \frac{\sum_{x=0}^5 M_x \left( Y_x - \frac{Y_4 + Y_5}{2} \right)}{\sum_{x=0}^5 M_x^2}$$

$$b = -20a$$

$$c = 69.75a + \frac{Y_4 + Y_5}{2}$$

where  $Y_x$  is the observed rate in the year 1950 +  $x$ , and  $M_x = x^2 - 2x + 69.75$ .

Separate equations conforming to the conditions set forth above were computed for each of the series of age-parity rates and mathematically extrapolated to 1960. As a visual check on the goodness of fit, freehand curves were also plotted and extrapolated, and the results were compared with those obtained mathematically. In a few cases the freehand curve appeared to provide a more reasonable basis for projection purposes, and these were so used. But in general, the mathematical results were found to be suitable. Age-parity rates were then derived algebraically for each year 1956 to 1960, and the rates for the latter year were used also for the 1961-65 period.

#### Cohort Survival

The next step in the projections was the application of the projected rates successively each year to the numbers of women of corres-

Table 1. Series A birth projection results for the United States, 1956-65<sup>1</sup>

Year	Total	Live birth order							
		1	2	3	4	5	6	7	8 and over
Number in thousands									
1955 <sup>2</sup>	4, 104	1, 138	1, 104	800	462	249	139	80	132
1956	4, 204	1, 147	1, 100	818	491	270	151	87	139
1957	4, 287	1, 164	1, 094	828	511	288	163	94	146
1958	4, 341	1, 151	1, 094	835	529	304	174	101	154
1959	4, 385	1, 135	1, 090	840	544	319	185	108	164
1960	4, 446	1, 148	1, 079	844	556	332	196	116	175
1961	4, 538	1, 189	1, 075	846	567	345	206	123	187
1962	4, 630	1, 220	1, 083	848	577	356	216	130	200
1963	4, 735	1, 256	1, 098	853	586	367	225	137	213
1964	4, 856	1, 298	1, 121	862	594	377	234	144	226
1965	4, 994	1, 345	1, 150	875	604	387	243	150	240
Rate per 1,000 women 15-44 years old <sup>3</sup>									
1955 <sup>2</sup>	116. 2	32. 2	31. 3	22. 6	13. 1	7. 1	3. 9	2. 3	3. 7
1956	118. 6	32. 4	31. 1	23. 1	13. 9	7. 6	4. 3	2. 5	3. 9
1957	120. 2	32. 6	30. 7	23. 2	14. 3	8. 1	4. 6	2. 6	4. 1
1958	120. 5	31. 9	30. 3	23. 2	14. 7	8. 4	4. 8	2. 8	4. 3
1959	120. 7	31. 2	30. 0	23. 1	15. 0	8. 8	5. 1	3. 0	4. 5
1960	121. 6	31. 4	29. 5	23. 1	15. 2	9. 1	5. 4	3. 2	4. 8
1961	123. 2	32. 3	29. 2	23. 0	15. 4	9. 4	5. 6	3. 3	5. 1
1962	123. 6	32. 6	28. 9	22. 6	15. 4	9. 5	5. 8	3. 5	5. 3
1963	124. 5	33. 0	28. 9	22. 4	15. 4	9. 7	5. 9	3. 6	5. 6
1964	125. 8	33. 6	29. 0	22. 3	15. 4	9. 8	6. 1	3. 7	5. 9
1965	127. 6	34. 4	29. 4	22. 4	15. 4	9. 9	6. 2	3. 8	6. 1

<sup>1</sup> Based on assumption that 1950-55 trends in age-parity specific rates will level off by 1960.

<sup>2</sup> Actual.

<sup>3</sup> Rates based on Whelpton's population estimates, which differ slightly from those prepared by the Bureau of the Census and used in National Office of Vital Statistics publications.

ponding parity and age. The method used was that of cohort survival. This refers to the shifting of a population at a given date forward in time, making allowances in each age cohort for attrition due to mortality and for adjustments in its parity composition. As each cohort advances from one year to the next, its parity distribution changes to reflect its fertility experience in the previous year. The process involves an iterative series of successively linked computations.

#### *Mortality and Migration*

Mortality projections were needed to compute the proportion of each population cohort surviving from one year to the next during the 1956-65 period. The necessary survival factors were furnished by Thomas N. E. Greville, assistant chief actuary, Social Security Admin-

istration. They reflect assumptions of "medium" mortality during the 10-year period, that is, a moderate continuation of the presently declining mortality trends.

Account was taken separately of the number of births to the net immigrant population during the 1956-65 period. Estimates were obtained from the Bureau of the Census of female immigrant population projections by age for the 1957-60 and 1961-65 periods. From these data estimates of annual net immigration were derived. The cohort survival method was used to obtain the age distribution of each year's complement of immigrant females in each of the remaining years of the projection period. To the cumulative totals of immigrant females in each year 1956-65 were then applied the age-specific fertility rates derived for the general population. The contribution of immi-



grants to the total number of births during the projection period is small. For 1960, births to immigrants represent only 1.7 percent of the estimated total, and for 1965 less than 3 percent.

#### *Adjustment of First-Birth Estimates*

An analysis of first-birth and marriage figures during the postwar period shows a high linear correlation (.96) between the two variables, with a lag of 1 year. It is believed that, if this relationship is utilized, some further refinement is introduced into the projections of first births for 1956-58. Since annual marriage data are presently available only through 1957, it is not possible to carry out the adjustment of first-birth projections beyond 1958.

The following regression equation for the relationship between marriages ( $X$ ) in year  $M$  and first births ( $Y$ ) in year  $M + 1$  was derived for the period 1948-55:

$$Y = 668,000 + 0.3128X$$

The adjustment of first births by single years of age of mother in the original projections to the estimate of first births based on marriages was made on a pro rata basis. The revised figures differed only slightly from those obtained by the use of parity rates; the amount of ad-

**Table 2. Cumulative birth rates<sup>1</sup> for cohorts of women surviving to 1955 and 1965, continental United States**

Age (years)	1955 rate	1965			
		Series A projection		Series B projection	
		Rate	Percent increase over 1955	Rate	Percent increase over 1955
15-19	96	95	-1.0	100	4.2
20-24	865	967	11.8	923	6.7
25-29	1,718	2,163	25.9	2,062	20.0
30-34	2,194	2,889	31.7	2,821	28.6
35-39	2,318	3,054	31.8	3,006	29.7
40-44	2,263	2,889	27.7	2,866	26.6
45-47	2,233	2,646	18.5	2,638	18.1

<sup>1</sup> Number births per 1,000 women.

NOTE: Data for 1955 based on actual figures; data for 1965 derived from birth projections.

**Table 3. Estimated percent childless among cohorts of women surviving to 1955, 1960, and 1965<sup>1</sup>**

Age (years)	1955	Series A projection		Series B projection	
		1960	1965	1960	1965
15-19	92.2	91.9	92.3	92.0	92.0
20-24	50.1	46.2	46.2	48.2	48.2
25-29	24.2	19.4	17.5	20.0	19.2
30-34	15.7	13.7	11.1	13.8	11.4
35-39	17.1	11.6	10.1	11.8	10.4
40-44	20.7	15.9	10.7	15.9	10.9
45-47	22.5	20.0	13.7	20.0	13.7

<sup>1</sup> 1955, actual; 1960 and 1965, projected.

justment averaged about 1 percent per year for the 3 years.

#### *Results*

On the basis of series A assumptions, total live births increase from 4,104,000 in 1955 to 4,446,000 in 1960, and then climb more rapidly to reach a figure of 4,994,000 in 1965 (table 1). First births, after an initial rise from 1,138,000 in 1955 to 1,164,000 in 1957, drop off slightly in 1958 and 1959. Thereafter, however, the number climbs steadily to 1,345,000 in 1965.

Second births decline for the first 6 years of the projection period (from 1,104,000 in 1955 to 1,075,000 in 1961), then turn upward during the next 4 years, and by 1965 number 1,150,000. All higher-order births increase consistently during the 10-year span. The following figures show the relative increase of birth-order frequencies from 1955 to 1965 implied by projection series A:

Live birth order	Percent increase
Total	21.7
First	18.2
Second	4.2
Third	9.4
Fourth	30.7
Fifth	55.4
Sixth	74.8
Seventh	87.5
Eighth and over	81.8

An interesting aspect of this birth projection technique is that it permits the derivation of cumulative fertility rates and estimates of the

percentage of women at various ages who are childless. The cumulative fertility rate is the number of births per 1,000 survivors of each cohort. This measure is useful in relation to questions regarding the extent to which family size is increasing. For example, table 2 shows that in 1955, women aged 45-47 years had a cumulative fertility rate of 2,233 births per 1,000. The corresponding age group, according to the fertility assumptions of series A, will have a rate of 2,646 per 1,000 in 1965.

It is recognized, of course, that the foregoing figures represent the extension of current high levels of fertility. These high levels may be due to the fact that relatively more women are marrying, are doing so at a younger age, and are completing their families earlier in life. To the extent, therefore, that the current situation is attributable to these factors, the result may be primarily a change in the timing and spacing of children in relation to the mother's age and the duration of marriage rather than a large increase in the total number of children she will ultimately bear.

Table 3 shows the estimated percentages of

women who were childless at specified ages in 1955 and the corresponding percentages in 1965, based on series A projections. According to these figures, a much smaller proportion of the women surviving to the end of their child-bearing period will be childless in 1965 than is presently the case. In 1955, 23 percent of the women reached the end of their reproductive span without having a live birth. For women reaching age 45 years in 1965, the corresponding proportion would be 14 percent. The latter figure is only partially dependent upon the birth assumptions of series A. The women who will reach ages 45-47 years in 1965 had already experienced such high first-birth rates by 1955, at which time they were aged 35-37, that only 15 percent were still childless. Hence, regardless of their fertility experience during the next 10 years, they will have a substantially lower rate of childlessness in 1965 than the corresponding age group a decade earlier.

It is possible to compare series A projections for 1956 and 1957 with figures now available for these years. Insofar as the totals are concerned, the projected figures are within 0.3

**Table 4. Comparison of projected birth figures <sup>1</sup> for 1956 with final tabulated data for that year**

Classification	Number of live births		Percent difference <sup>2</sup>
	Projected	Actual	
Total.....	4, 204, 000	4, 218, 000	0. 31
<i>Birth order</i>			
First.....	1, 147, 000	1, 166, 000	-1. 6
Second.....	1, 100, 000	1, 109, 000	-. 8
Third.....	818, 000	821, 000	-. 4
Fourth.....	491, 000	483, 000	+1. 7
Fifth.....	270, 000	263, 000	+2. 7
Sixth.....	151, 000	149, 000	+1. 3
Seventh.....	87, 000	87, 000	0
Eighth and over.....	139, 000	139, 000	0
<i>Age of mother (years)</i>			
10-14.....	7, 000	7, 000	0
15-19.....	515, 000	530, 000	-2. 8
20-24.....	1, 314, 000	1, 342, 000	-2. 1
25-29.....	1, 142, 000	1, 144, 000	-. 2
30-34.....	756, 000	736, 000	+2. 7
35-39.....	370, 000	362, 000	+2. 2
40-44.....	94, 000	92, 000	+2. 2
45 and over.....	5, 000	5, 000	0

<sup>1</sup> Projections based on assumption that 1950-55 trends in age-parity rates will level off by 1960. Both projected and actual numbers adjusted for under-registration.

<sup>2</sup> Actual figure is base in computation.

NOTE: For 1957 only provisional figures are available. The 1957 total, according to these figures, is 4,301,000, or only 0.3 percent higher than the projected total of 4,287,000.

Table 5. Series B birth projection results for the United States, 1956-65<sup>1</sup>

Year	Total	Live birth order							
		1	2	3	4	5	6	7	8 and over
	Number in thousands								
1955 <sup>2</sup>	4, 104	1, 138	1, 104	800	462	249	139	80	132
1956	4, 111	1, 117	1, 075	802	480	265	149	86	137
1957	4, 121	1, 107	1, 052	801	496	271	159	92	144
1958	4, 159	1, 108	1, 034	798	508	294	167	98	152
1959	4, 201	1, 118	1, 024	794	517	306	177	104	161
1960	4, 259	1, 137	1, 022	791	524	316	187	110	171
1961	4, 330	1, 162	1, 028	791	530	325	195	117	182
1962	4, 418	1, 196	1, 041	793	536	333	203	123	193
1963	4, 518	1, 232	1, 061	800	542	340	210	129	205
1964	4, 633	1, 274	1, 086	810	548	347	217	134	217
1965	4, 762	1, 320	1, 116	824	556	354	223	139	229
	Rate per 1,000 women 15-44 years old <sup>3</sup>								
1955 <sup>2</sup>	116. 2	32. 2	31. 3	22. 6	13. 1	7. 1	3. 9	2. 3	3. 7
1956	116. 0	31. 5	30. 3	22. 6	13. 6	7. 5	4. 2	2. 4	3. 9
1957	115. 5	31. 0	29. 5	22. 5	13. 9	7. 6	4. 5	2. 6	4. 0
1958	115. 4	30. 7	28. 7	22. 1	14. 1	8. 2	4. 6	2. 7	4. 2
1959	115. 7	30. 8	28. 2	21. 9	14. 2	8. 4	4. 9	2. 9	4. 4
1960	116. 5	31. 1	28. 0	21. 6	14. 3	8. 6	5. 1	3. 0	4. 7
1961	117. 6	31. 5	27. 9	21. 5	14. 4	8. 8	5. 3	3. 2	4. 9
1962	117. 9	31. 9	27. 8	21. 2	14. 3	8. 9	5. 4	3. 3	5. 2
1963	118. 8	32. 4	27. 9	21. 0	14. 2	8. 9	5. 5	3. 4	5. 4
1964	120. 0	33. 0	28. 1	21. 0	14. 2	9. 0	5. 6	3. 5	5. 6
1965	121. 7	33. 7	28. 5	21. 0	14. 2	9. 0	5. 7	3. 6	5. 9

<sup>1</sup> Based on assumption that rates in 1956-65 will remain at 1955 level.

<sup>2</sup> Actual.

<sup>3</sup> Rates based on Whelpton's population estimates, which differ slightly from those prepared by the Bureau of the Census and used in National Office of Vital Statistics publications.

percent of the official counts (table 4). With regard to birth order, the largest difference in 1956 was 2.7 percent, and the unweighted average difference for all birth orders, ignoring signs, 1.1 percent. The situation was similar with respect to age of mother. The largest difference was 2.8 percent, and the average difference, 1.5 percent. Virtually all the projected birth-order and age-of-mother totals for 1956 correctly reflected the direction of the true change from 1955. National data for 1957 by age of mother and birth order have not yet been tabulated. It is recognized, of course, that 1- or 2-year projections, however made, are much more apt to approximate the actual counts than projections 5 or 10 years ahead.

#### Projection Series B

A second projection, series B, was computed on the basis of the fertility assumption

that the age-parity birth probabilities during the period 1956-65 would be the same as in 1955. The mortality and migration assumptions are the same as in series A. The results are shown in tables 2, 3, and 5.

Series B births in 1956 and 1957 are below the numbers actually occurring in these years, and present indications are that they will fall short of 1958 experience. Should there be a downturn in fertility during the remaining years of the projection period, however, series B projections may provide a closer approximation of the birth situation during the first half of the 1960 decade than series A. In addition to its usefulness as a "low" series in bracketing possible future natality experience, series B serves two other purposes. It throws light on the question of the extent to which population and parity factors would result in a rise in the number of live births despite a



leveling off of the fertility rate as such, and it is useful in demonstrating the practical differences between projection results based on age-parity rates and those based on age-specific rates.

### Comparison of Methods

For the purpose of comparing the two methods of estimating births, another projection, series C, was made for the 1956-65 period. Series C parallels series B in all respects except the method of measuring fertility. In series B, age-parity rates were used; in series C, age-specific rates. In both series, however, fertility was assumed to be the same in each year during the period 1956-65 as in 1955.

Table 6, which presents a comparison of the results of series B and series C projections, shows that there is an initially small but gradually widening gap between the total numbers of births obtained by the two methods, with series B yielding the larger numbers. By 1960, there is a difference of 2.5 percent, and by 1965 this gap widens to 4.8 percent. Differences for the individual age-of-mother groups are even greater. In 1965, for example, the projected number of births to mothers 30-34 years of age is 10 percent greater than the number obtained by the age-specific rate

method. At ages 35-39 years, the difference is 18 percent. It should be emphasized that these differences are a function of the specific assumptions of population composition and fertility in this particular situation. They are not necessarily the maximum differences that could result from the use of the alternative methods.

### Conclusion

As stated at the outset, the illustrative projections presented here are not predictions. No effort has been made to prognosticate trends in the social, psychological, and economic variables affecting fertility. The parity-rate method of birth projection, like the age-specific rate method, is essentially a mechanism for translating assumptions of future fertility into numbers of births. The significant difference between the two methods is that the use of parity rates provides a greater degree of fidelity in the resultant translation.

The age-parity rate is, of course, not the ultimate refinement in fertility measurement. If adequate child-spacing and marriage-duration data were available, the additional use of these variables would permit further delineation as to fertility risk status, and probably would improve the stability of the time-series data forming the basis of fertility projections.

**Table 6. Comparison of series B and series C for 1956, 1960, and 1965**

[Numbers in thousands]

Age of mother (years)	1956			1960			1965		
	Series B	Series C	Percent difference	Series B	Series C	Percent difference	Series B	Series C	Percent difference
Total	4, 111	4, 088	+0. 6	4, 259	4, 155	+2. 5	4, 762	4, 545	+4. 8
10-14	6	6	0	7	7	0	8	9	-11. 1
15-19	505	506	- . 2	596	599	- . 5	739	737	+ . 3
20-24	1, 283	1, 275	+ . 6	1, 346	1, 331	+1. 1	1, 632	1, 610	+1. 4
25-29	1, 121	1, 117	+ . 4	1, 062	1, 038	+2. 3	1, 112	1, 072	+3. 7
30-34	735	731	+ . 5	738	708	+4. 2	717	651	+10. 1
35-39	363	356	+2. 0	402	372	+8. 1	426	360	+18. 3
40-44	92	91	+1. 1	101	94	+7. 4	120	100	+20. 0
45 and over	5	5	0	6	6	0	7	6	+16. 7

NOTE: Series C is base for computation of percent difference. A + sign indicates that the series B figure is the larger.

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## Cockroaches as Vectors

Recent publication of Medical and Veterinary Importance of Cockroaches by Lewis M. Roth and Edwin R. Willis (Smithsonian Publication No. 4299, 1957) has raised the question as to whether the cockroach is being neglected as a vector of infectious disease. It is well that the question is raised, because conventional assumptions in public health work deserve periodic appraisal and challenge. That the authors make no solid case for more energetic suppression of the cockroach as a disease vector does not detract from the utility of their work as a compendium of information that was formerly scattered to the far ends of the library shelves.

Cockroaches are recognized as mechanical transmitters of various pathogens, and because of this and their general obnoxious characteristics they have been and will continue to be the object of individual and community control efforts. The data presented only confirm this situation.

Roth and Willis have outlined the habits, habitats, and dispersal of cockroaches and the association of cockroaches with viruses, bacteria, fungi, protozoa, and helminths. They review bites and allergic responses, accidental invasion of man, cockroaches as human food, cockroaches in medicine and folklore, and diseases incorrectly attributed to cockroaches. They compare the significance of cockroaches and flies. Especially useful is their annotated list of pathogenic organisms and their reported association with cockroaches.

The authors undertake to prove that cockroaches are highly dangerous potential vec-

tors of disease. But the association of cockroaches with pathogens is yet to be adequately evaluated.

Epidemiologists do not consider that reports of the presence of pathogenic organisms on cockroaches is evidence that the species is a natural vector. Neither is survival of the pathogens after experimental inoculation in cockroaches proof that roaches are experimental vectors. Ecologic associations need to be demonstrated to support such a claim.

The work of Marcel Graffar and Simone Mertens (Ann. Inst. Pasteur, Paris, 79: 654-660, 1950) cited by Roth and Willis is the most persuasive study reported. These workers observed that during an epidemic of food poisoning new infections of *Salmonella typhimurium* occurred in spite of quick isolation of patients, the absence of healthy carriers, and the lack of detectable contact except through cockroaches. It was observed that cockroaches overran the nursery at night and *S. typhimurium* was isolated from cockroaches in the vicinity of the infants. The epidemic was checked immediately when the nursery was disinfected with DDT. The epidemiological data cited do not definitely incriminate cockroaches even in this instance.

Structural and ecologic adaptations of cockroaches which are conducive to their potential as disease vectors are widely recognized. One may well speculate as to why they are not more prominent as conveyors of pathogens. New evidence or reinterpretations of present evidence may eventually shed the necessary light.

—MELVIN H. GOODWIN, JR., PH.D., *Chief, Phoenix Field Station, Communicable Disease Center, Public Health Service*

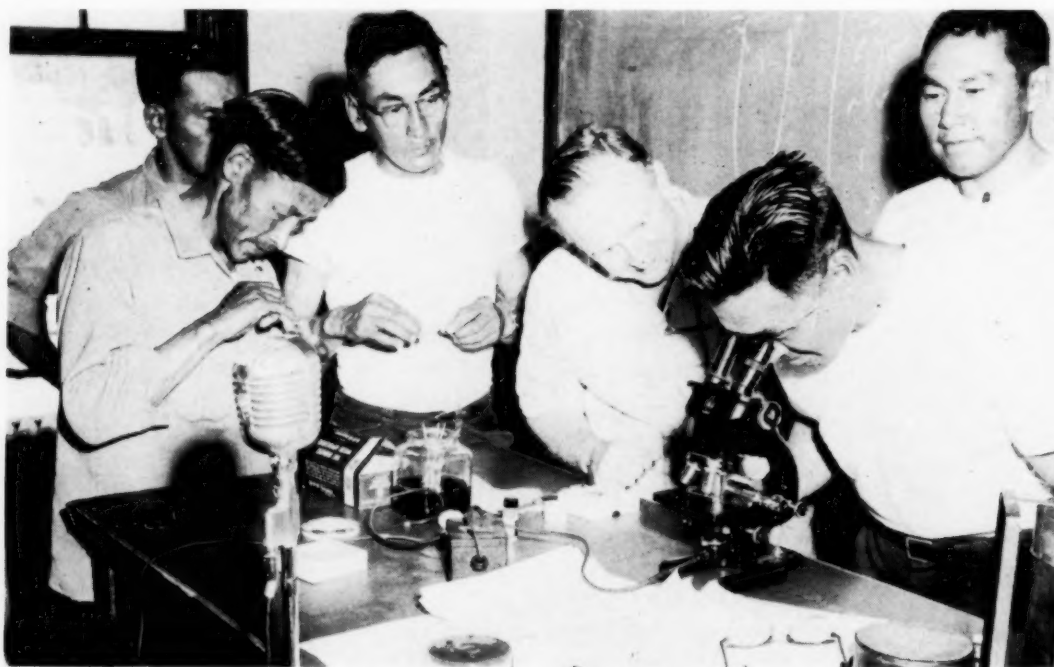


Robert Cleveland, *left*, of Shungnak and Joseph Lomack of Akiachak make a laboratory slide as they learn about germs in the sanitation aides' course. A microscopic view of the bacteria of tuberculosis, a disease familiar to them, is a peek at a new world.

## Eskimo Sanitarians

Providing isolated Eskimo villages on the shores of the Arctic Ocean with a safe water supply and adequate waste disposal is a challenge. Year-round permafrost, a frozen water supply, summer flies and mosquitoes, and a people bound by traditions are some of the obstacles to sanitation in such villages. But villagers are overcoming the obstacles with the help of the Sanitation and Engineering Section, Alaska Department of Health.

Under contract to the Alaska Native Health Service of the Public Health Service, the department in 1955 began training men, selected by their village councils,



Instructor Jim Savage, *third right*, shows village presidents, through a microscope, material removed from their teeth. To further the aides' future

projects in their own communities, the presidents of their home villages joined the students for the last week of the 1957 course at the University of Alaska.



to be sanitation aides. In a month's course at the University of Alaska in Fairbanks, given by members of the department, a man from an Eskimo village learns ways of outwitting or using the harsh environment in practicing sanitation.

He learns about germs, as well as why and where dog teams should be tethered, about jetting wells through the permafrost, and how to use oil drums and sod pits in waste disposal. He also masters tools he may never have seen before and practices the techniques of persuading people to adopt the new devices he has learned to make.

When the sanitation aide completes the course and returns to his village, he is equipped with the tools he will need as well as his new knowledge. To a people accustomed to centuries-old ways, the Eskimo sanitation aides bring a chance for better lives. (Photographs were supplied by the Sanitation and Engineering Section, Alaska Department of Health.)



In fieldwork during the course at Fairbanks, aides fasten faucets in water barrels used to collect rain from the roofs in villages when other sources of water are lacking. The men learn to use tools, such as the knock-out punch, which some have never seen before.



Teddy Brink of Kasiglook uses a level to check the slope of the barrel stand so that water will flow into the house even under a low head. A pebble tied

to the string hanging from the trough to the top of the barrel serves as an eave spout. Class project was installing rainwater system for this building.



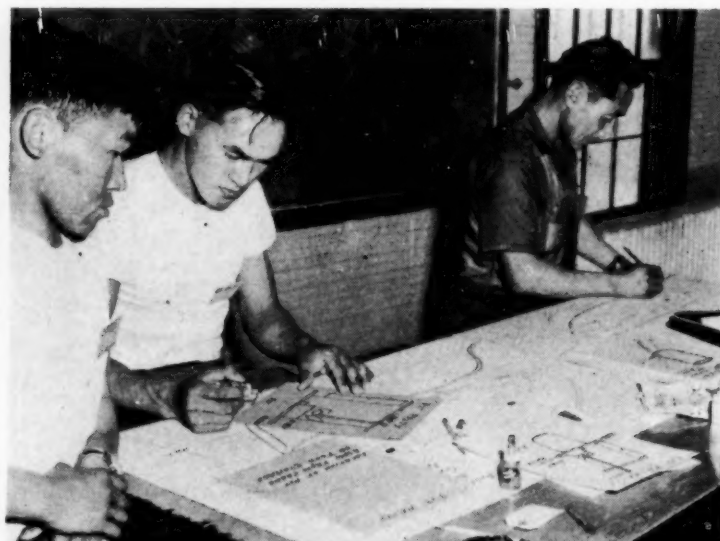
Sanitation aides rig a tripod for exploratory jetting and drilling for water. Fieldwork was done in the university's geophysical area.



Cutting and threading water pipes are tasks new to them, but Herb Apassingok, *left*, of Gambell, and Teddy Brink readily master the skill.



Tom Brown, *left*, of White Mountain and Wilbur Karmun of Deering complete a grate for an incinerator. In an Eskimo village, dog food would be heated on top of the drum while trash was



burned inside. *Right.* Students prepare training aids they will use to introduce new devices in their home villages. Community education methods are a part of the aides' course.

*The surgeon's personal attention to his patient and careful explanation of surgical procedures reduce apprehensions and aid recovery.*

## Psychological Preparation for Surgery

CHARLES S. BRANT, Ph.D., HERBERT VOLK, M.D., Med.Sc.D., and BERNARD KUTNER, Ph.D.

NEARLY all practicing surgeons would agree in principle that a total-care approach to the management of patients undergoing surgery should include careful psychological preparation. But such preparation for emotional and social problems resulting from hospitalization, surgery, convalescence, and rehabilitation is not always regarded as essential to comprehensive medicine, even though the literature attests to its importance. Kaufman (1) writing of the patient's need for emotional support, states:

"The patient must be emotionally prepared to accept necessary surgery without undue anxiety and fear. Everything must be directed toward reducing the psychological stress and trauma of anesthesia and surgery to a minimum. The patient must receive the emotional support he needs and deserves during the immediate post-operative periods. . . . A properly utilized half hour or hour of psychological preparation may give the patient sufficient emotional security to obviate preventable psychosomatic complications. Furthermore, it seems to me that such

briefing reduces the patient's anxieties and fears to such an extent that he takes the anesthesia better and has less postoperative pain and discomfort. . . . And he seems to make speedier recovery from the effects of surgery than the patient who is emotionally unprepared. This is equally true for emotionally normal patients as it is for neurotic patients."

Dyk and Sutherland (2) also stress the surgical patient's need for emotional guidance and rapport with his surgeon. In their study of colostomy patients they found that "anxiety and fear of injury, in some cases mounting to confusion, panic, or despair, were reported by all as reactions to impending surgery."

In another report, concerned with depressive reactions of patients to cancer surgery, Sutherland and Orbach (3), after speaking of anxieties about the nature of the disease, the impending surgery, possible death, or post-surgical social isolation and inacceptability, commented:

"These reactions are particularly prone to occur when the patient is unable to relate to medical personnel. . . . Mistrust is reinforced by the impersonality of clinic and ward procedures and the 'faceless surgeons.' To one depressed patient, surgery represented being cut up by a group of strangers."

Elsewhere, Sutherland (4) wrote: "Apparently prophylaxis is the best treatment. A warm relationship between the patient and the physician is essential. This relationship should permit the doctor to be seen as protective rather than threatening; it should permit easy com-

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munication and discussion of irrational beliefs and misconceptions. . . .

"A good patient-physician relationship, beginning with the initial diagnostic examination, is the patient's best guarantee against the development of crippling beliefs and their expression in unnecessary restriction of activities."

Others have emphasized the surgical patient's need for information and explanation. For example, the widely known standard textbook, Babcock's *Principles and Practice of Surgery* (5), states:

"Perhaps the best preparation for surgery is for the patient to know his surgeon. Many times contact with the surgeon is so limited that countless questions go unanswered, causing the patient great worry. It is necessary for the surgeon to explain the purpose of the surgery. While this may be quite obvious to him, it is not always obvious to the patient. . . . Patients want to know what is to be done and why."

In an essay written in 1928, Cabot (6), referring to the impact of the hospital environment upon the patient, said: "The patient finds himself facing a new and often terrible situation. To enter the hospital is often for him the most momentous event of his life, and he needs all the help that can be given him to understand it."

Although every physician appreciates the importance of a sound physician-patient relationship, and every surgeon knows that his patient is a sentient human being with hopes and fears that affect his attitudes toward treatment, we have found that the interpersonal and communicative aspects of the physician-patient relationship in surgical practice are comparatively too often neglected. Generally, in private surgical practice, the physician is keenly aware of his patient's needs. However, since a substantial number of surgical patients receive care from physicians in surgical residency in government-supported hospitals, gaps may appear between patient needs and surgical practice. In 1954, an estimated 1,657,550 surgical patients were discharged from government-supported hospitals in the United States (7). Presumably, the resident staff treated the vast majority of these patients as well as an un-

determined proportion of some 6½ million surgically discharged patients in non-government-supported hospitals.

### Purpose of Study

The teaching hospital is one strategic setting for developing in young physicians a comprehensive approach to medical care centered upon the patient. It is here, as intern and resident, that the young physician may acquire, through intensive instruction and by demonstration, example, and practice many of his most important skills and his basic attitudes about patient care.

In order to examine relationships and attitudes between physician and patient, we undertook an exploratory study of the surgical service of the Bronx Municipal Hospital Center, which is the teaching hospital of the Albert Einstein College of Medicine, Yeshiva University. Most of the patients, house-staff members, and nurses interviewed and observed were on the general surgical service. The study was conducted during the second year of the hospital's existence, a period when the organization of services and activities was formative rather than firmly established. Other relevant background factors were: (a) the medical school with which the hospital is affiliated was also in its second year of existence; students, therefore, had not yet begun serving clinical clerkships; (b) the surgical service was frequently extremely busy, with wards filled to capacity or nearly so; (c) there was an acute shortage and considerable turnover of experienced graduate nurses, practical nurses, and nurse's aides; (d) emergency cases constituted a large percentage of the total work of the surgical service; and (e) the patient population was largely geriatric immigrants of European origin and had language difficulties and environmental handicaps.

### Procedures

Before and after operations, we interviewed 50 surgical patients, unselected except for diagnosis. The selected diagnoses were gastrointestinal, genitourinary, gall bladder, peripheral vascular, respiratory, and skin disorders. Formal interviews were held with a

sample of the resident surgical staff and graduate nurses on the surgical wards, and informal interviews, of varying length and depth, with a sample of interns serving on the surgical service. We also observed interactions between physicians and patients receiving treatment on the wards, during teaching rounds conducted by the attending surgeons and in the recovery room.

## Results

Some qualitative findings from the study throw light on the question: What are the inherent problems, difficulties, or obstacles in developing total care for surgical patients in a teaching hospital setting? Other findings from this study have been presented in somewhat different contexts (8,9).

*Case 1.* A 66-year-old retired, unmarried, white woman came to the hospital because she had noticed 2 weeks earlier two small lumps in one of her breasts. When she noticed the lumps, the patient stated, she believed they were due to nervousness, for which she sought relief. In the clinic, the physician said that the lumps were "something serious" and that she should enter the hospital for treatment. At that point, the patient asked if she couldn't go home and return in 2 days, a request made, she admits, for the purpose of avoiding hospitalization. She was dissuaded from this course and admitted to the inpatient surgical service.

Following admission, the surgical staff decided that the patient should have a biopsy and possibly a radical mastectomy. The intern assigned to the case told the patient it was necessary to remove "a little" of the lumps, that then they would probably "go further" with surgery, perhaps removing the entire breast, although they hoped it could be avoided, and that following this surgery, the patient would receive "some treatments." The patient ventured anxiously, "I hope it's not too serious." The physician replied, "No, no. Now you just smile and don't worry." The patient then signed the consent-for-surgery form and the intern left. The patient stated in the preoperative interview that she was nervous and afraid of surgery and recalled postoperative pain from a hemorrhoidectomy some

years earlier. She added that it was a shock to her to come to the hospital for relief of nervousness and be hospitalized for surgery.

The surgery consisted of a biopsy and simple mastectomy, followed by radiotherapy.

At postoperative interview, the patient stated that going to the operating room she felt frightened and worried about survival, and regretted she didn't tell her friends goodbye, just in case she didn't return. When she awakened from anesthesia, she knew vaguely that she was "somewhere"; she heard only footsteps and it seemed very quiet. Her first feeling was again of being afraid and wondering if her breast was gone. This question went unanswered until the morning of the first postoperative day, when the intern told her only a small portion of the breast was removed and that she would receive "at least two" radiotherapy treatments. The patient thought she still felt a lump, and the intern explained that what she felt were sutures. The patient told us that she wanted to know what caused her trouble and what she would need to do to care for herself at home but felt "too timid" to ask questions of the doctors.

A few days after the operation the patient received her first radiotherapy. Interviewed the following day, she stated that the experience was very frightening: The sight of instruments on a table in the radiotherapy room made her fearful that further surgery was planned, and the radiotherapy equipment itself, upon being lowered over her, was fear provoking. Nothing the patient could recall indicated that the radiotherapy procedures had been explained to her.

Here we see manifestly an anxious, elderly lady, in whom ignorance concerning cancer or denial of the illness was operating. Proper psychological management of her case required a fuller understanding of her emotional responses to the ominous news of possible major breast surgery and even death. Fear of surgery, concern over removal of a breast, and anxiety about one's death are the most common emotions found in patients with breast disease. If they are not dealt with directly, patients go to and return from surgery with unrelieved apprehensions.

*Case 2.* A 50-year-old white salesman with

a long history of diabetes entered the hospital with circulatory insufficiency in the right leg. He was scheduled for a below-knee amputation and subsequent transfer to the rehabilitation service for reambulation and prosthesis.

Prior to admission, the patient had been treated unsuccessfully for almost 1 year at several hospitals. The interview disclosed that the failure of therapies had led the patient to lose considerable confidence in physicians. While on the operating table under spinal anesthesia at another hospital, the patient had been acutely distressed upon hearing the surgeons dispute improper functioning of their equipment. This caused him to feel he was in the hands of incompetent people.

The patient, accustomed to a very active life, was most anxious to learn how long his treatment and rehabilitation would keep him from returning to work. He felt that the year already consumed was "like a lifetime." Five days after the operation, one physician informed the patient that he would go to the rehabilitation service soon, and in "no time at all" he would be up and on his way home. He was also assured that a modern prosthesis is usually easy to fit and to use.

Unfortunately, the patient developed a wound infection which necessitated continued treatment on the surgical ward. He developed a reactive depression and complained vociferously. The intern assigned to the case was annoyed by the patient's temperament and demands, feeling there was nothing he could do for the patient beyond changing his dressings daily.

When the infection cleared and the patient was transferred to the rehabilitation service, he stated that he felt much better because now he was "getting somewhere."

This case reveals the need to counsel the patient who has been through prolonged and varied therapy without positive result so that he may understand the rationale of the planning and maintain his confidence in the medical profession. It points up the consequence of overoptimistic and unqualified statements about the length of treatment and rehabilitation, and the need to apprise the patient realistically of what lies ahead before he can resume his regular activities. As for a patient with major

rehabilitation facing him, the doctor's role is by no means confined to the immediate medical treatment. The intern, in this particular case, instead of reacting with a sense of personal annoyance to his patient's anxieties, might have devoted some time to psychological support and viewed his patient's temperamental response as an aspect of the patient's anxiety about the future.

*Case 3.* A 17-year-old high school girl entered the hospital complaining of dysuria. She was scheduled for cystoscopy 2 days later.

When interviewed, the patient was asked to relate what she believed her trouble was and what the doctors were planning to do for her. In an angry mood, she said: "Dr. L. said they are going to do some kind of examination on me, tomorrow, I think. They say there is something wrong with my kidneys, but they didn't say what. I'd like to know why a young person like me should have kidney trouble, but Dr. L. is always rushing around all the time and I don't get a chance to ask him anything. He doesn't talk to you like a patient." When asked what she meant by the last sentence, the patient said that she had been in another hospital where the doctors explained things to her.

On the day of the scheduled cystoscopy, the interviewer learned that it had been cancelled because the patient's parent had not come to the hospital to give consent for the procedure. The patient had learned that the proposed examination was a cystoscopy, and, having previously had this procedure and finding it painful, prevailed upon her parent not to consent. The patient was discharged to be followed in clinic.

It is evident that in addition to being anxious about a painful diagnostic procedure, the patient wanted the physician to tell her the reason for her illness and the procedure that would be followed. The physician-patient relationship was so undeveloped and communication with the patient was so minimal that the patient acted against medical advice and her own interests. The value of forthright, even if brief, explanation of procedures and planning, presented in a manner that will not alarm the patient, cannot be overestimated. An impersonal attitude toward the patient is one of the contributing factors in the failure of patients to follow medical advice.



*Case 4.* A 47-year-old married man was sent to the hospital by his private physician, who had told him that an X-ray showed a shadow on part of one lung and that this might be a tumor. He was given the same diagnosis by staff physicians in the hospital.

The patient's conception of the intended treatment was "an operation on the part of the lung with the shadow." This was to be done the following day.

Asked if he had questioned the staff physicians about his illness or the planned surgery, the patient said: "Oh, yes. The doctors told me they would like me to ask them about anything that was on my mind. I wondered if the tumor in my lung couldn't be cured by radium. They explained that the best way to be sure I would be cured would be to take the tumor out completely. I believe I really felt a little afraid of an operation on my lung since my family doctor wouldn't even do one on the hernia that I've had a long time. I told the doctors here about this, and they explained to me that this was because the lung problem was more urgent. They assured me that all the tests showed my general health was sound and that I could take the lung surgery without any danger." The patient added that he felt very relieved to have had things cleared in his mind through discussion with the staff physicians, because he had been quite upset when he first learned he required lung surgery.

Interviewed after the operation, the patient related that he felt he was getting fine treatment and singled out the staff surgeon's visits and comments about his progress as making him feel better both physically and mentally. His only problem was wanting to get up and around a little sooner than the surgeon wanted him to.

This case demonstrates as clearly as any studied the value of briefing the patient factually about postoperative events: He knew that he would awaken in the recovery room, where special care would be given; that he would be expected to cough, and the reason why; that there would be a drainage tube coming out from the operative area; that he would be on a restricted diet for a time; and that he would begin ambulation about 2 days postoperatively.

## Discussion

We introduced the above case studies with a question to which we now return: What are the inherent problems, difficulties, or obstacles in developing total care for surgical patients in a teaching hospital setting? Perhaps the central problem lies in the house officer's definition of his tasks in medical care and the purposes served by the institution. Quite obviously, he is there to learn, and to service hospital patients. Indeed, one may say that his purpose is to learn through serving. In the process of being a physician, he acquires knowledge and skills and extends his experience, which in turn make him a better physician. For the resident, the purpose is to learn to be a surgeon; for the intern, it is to learn more about surgery and care of surgical patients, perhaps as a preliminary to entering surgical residency training, perhaps only as part of general medical training.

The matter becomes somewhat more complex, however, when one goes beyond the obvious functions of the house officer and asks: What, is his conception of his role or task? What does he regard as relevant and significant knowledge to acquire, and what services should he provide? We find, in answer to these questions, that the house officer is more often than not preoccupied with the technical and mechanical aspects of surgery. The desire to communicate with the patient and to develop sound interpersonal relations is regarded as a luxury not expected in nonprivate practice. The ways in which these views are manifested vary from patient to patient and have differing consequences, as the illustrations indicate. In case 4, where the preparation for surgery was exemplary, the patient went to surgery with minimal anxiety and during postoperative convalescence cooperated fully and cheerfully, because he understood what was necessary and required of him.

## Recommendations

Planning for the development of an improved program for the total care of surgical patients in teaching hospitals must include standards for house staff practice and means of implementing these standards. Standards of practice should incorporate the following:

1. In addition to the basic physiological preparation of the patient for surgery, attention should be given to psychological factors. During, immediately after, and at regular intervals following admission to the surgical service, the medical staff alone or in conjunction with nursing and social work personnel should evaluate, by physiological and discursive means, the level of and changes in the patient's anxiety about hospitalization and surgery.

2. Hospital rules and regulations and normal procedures of examining, testing, and caring for vital functions should be explained to the patient upon admission and thereafter as indicated.

3. When the time for surgery has been scheduled, the patient should be informed as promptly as possible. Such information should be withheld until the last possible moment only in those instances in which receipt of such information is felt to be detrimental to the patient's general health.

4. In every instance the nature of the operation and the reasons for its being performed should be explained to the patient in terms he is capable of understanding, without necessarily revealing the diagnosis if this is deemed inadvisable (for example, to remove an "obstruction"; to "relieve pressure"). The patient or his family should not be guaranteed by the house officer the successful outcome of surgery.

5. In every instance the choice and type of anesthetic to be used should be explained to the patient by the anesthesiologist on the day of or evening preceding the operation. Whenever possible, such explanation should be given in emergency cases.

6. Preoperative preparation should include explanation of the physical preparation, transportation to the operating room, nature of the operating room, use of the recovery room (in cases where it is used), and length of time that will elapse before return to the ward.

7. Explanation of postoperative pain and other discomforts should be given the patient in advance of surgery.

8. Before the operation, the patient should be prepared for postoperative parenteral alimentation, drainage tubes, dressings, respira-

tory activity, range of mobility, and time of ambulation.

9. After the operation it is the surgeon's responsibility to discuss the results of surgery, the probable consequences, and the anticipated length of hospitalization and convalescence.

10. The surgeon should discuss the operation and its consequences with the referring physician and responsible members of the patient's family.

The means by which these standards of practice may be implemented are:

1. At the start of the hospital year, the house staff should be oriented through lectures, films, articles, and demonstrations dealing with the total care of surgical patients.

2. At evaluation conferences, house staff members (residents universally and interns where possible) should be given an opportunity to present cases completely worked up from surgical, social, and psychological points of view.

3. Each resident should be given specific instruction and supervision in the psychosocial, presurgical preparation of his patients and in the psychological, postsurgical management of his patients.

4. Teaching rounds should include a psychosocial evaluation of the patient's status and specific coverage of patient responses to the outcome of surgery.

5. Each resident should be instructed and supervised in methods of interviewing the patient and discussing with him and his relatives his problems.

6. Responsible senior surgeons periodically should rate and discuss ratings with residents and interns on the house officer's performance of the psychosocial aspect of his work as well as other aspects.

7. Psychiatrists, social workers, and social scientists should collaborate in these activities designed to improve physician-patient relationships.

## Summary

For the surgeon-in-training, the exigencies of a heavy work schedule, large patient load, and necessity of mastering the specialized knowledge and techniques of an increasingly com-

plex field leave little opportunity for him to become versed in the recognition and management of a patient's psychosocial needs. Such needs are recognized in surgical literature and by experienced practitioners and teachers of surgery, but they are often inadequately met. Standards of practice as well as steps to implement them are outlined, so that ideal surgical practice with respect to these needs may be approximated in the teaching hospital.

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### Textbook on Medical Care Organization

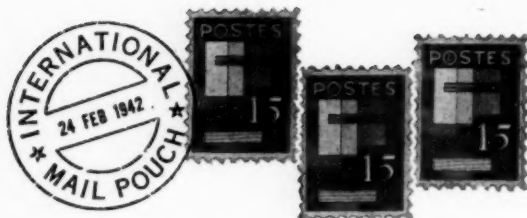
More than a hundred articles on the organization of medical care are brought together in the recently published textbook entitled "Readings in Medical Care," edited by the Committee on Medical Care Teaching of the Association of Teachers of Preventive Medicine.

The book contains basic studies dating back to the 1920's as well as important recent ones in books, journals, and monographs, together with extensive reading lists. Several articles appeared in *Public Health Reports* and other government publications, and many are the work of Government employees or former employees, printed elsewhere.

Prepared in response to a widely felt and frequently expressed need for teaching material, the new textbook grew out of a conference on preventive medicine in medical schools held in Colorado Springs in November 1952. This conference was sponsored by the Association of Teachers of Preventive Medicine and the Association of American Medical Colleges.

"Subsequent to that searching exploration of the growing importance of preventive medicine in medical education," Dr. George Packer Berry, of Harvard University, says in the foreword, "the Committee . . . have devoted their efforts to understanding, evaluating, and recording changes in the patterns of organization of medical care and health service."





### **Korean Texts**

Nurses in Korea will soon have five Korean texts to aid them. The medical care bureau of the Republic of Korea's Ministry of Health and Social Affairs recently issued Basic Nursing Methods and Nursing Care of Pregnant Women, and the Korean Nurses Association has ready for publication two other texts, Medical Nursing and Nursing Care of Children. The Korean Red Cross is planning to publish Home Nursing, which will be a useful reference for public health nurses, home economics teachers, and other professional workers as well as individual families.

—ALFRED S. LAZARUS, PH.D., *acting chief, Health and Sanitation Division, U. S. Operations Mission, Korea.*

### **Pipeline**

In one day, 100 villagers of Sapum, Thailand, built a pipeline to bring water to their small community from the nearest source, a hillside spring half a kilometer away. After several outlets were installed in the village, the people decided to build a storage tank at the spring and additional branch lines from the main distribution line to more remote parts of the village.

The people volunteered their labor, and the local health department provided the materials for the distribution system.

—ROBERT L. ZOBEL, M.D., *chief, Health Division, U. S. Operations Mission, Thailand.*

### **Male Nurses**

When the 17 men who started courses in February 1958 at the School of Nursing, Tubman National Institute of Medical Arts, Monrovia, are graduated, this profession may gain new status in Liberia.

Six men and twelve women are taking the 3-year course in professional nursing, and 11 men and 3 women are in the 2-year course for practical nurses.

The 8 students who will study midwifery for 2 years are women. These candidates for the school were selected from a much larger group by written examinations, given in many of the smaller towns as well as the capital, and personal interviews.

Only five of the students come from Monrovia; most are from much smaller towns and the rural areas. Eight are high school graduates, 13 have attended high school, and 15 completed the eighth grade. Their ages range from 16 to 34 years, with 23 as the average age in the professional nursing and midwifery courses and 22 in the practical nursing course.

The students listed their fathers' occupations on application blanks. Most of their fathers are farmers or fishermen, a few are teachers, and three are tribal chieftains.

—JAMES P. WARD, M.D., *chief, Public Health Division, U. S. Operations Mission, Liberia.*

### **Sick Students**

Fifty candidates came to take the entrance examinations at Itegue Menen School of Nursing in Asmara, Ethiopia. Of the 26 accepted after examination, it was necessary to treat 12 for trachoma, 14 for amebiasis, 2 for congenital syphilis, and 1 for ascariasis.

—A. C. CURTIS, M.D., *chief, Public Health Program, U. S. Operations Mission, Ethiopia.*

### **Occupational Health in Peru**

The Peruvian National Association on Occupational Health was formed after Peru's first national seminar in this field was held in January 1958. The medical directors and safety engineers of many industrial and mining companies in Peru as well as private physicians, nurses, and public health workers were among the 94 persons attending.

The seminar participants included faculty members from Harvard University, Marquette University, Peru's National University of Engineers, and San Marcos School of Medicine, the Peruvian and the United States consultants in industrial hygiene, and representatives from Brazil, Colombia, Bolivia, and Venezuela.

—FREDERICK J. VINTINNER, Sc.D., M.P.H., *chief, Division of Health and Sanitation, U. S. Operations Mission, Peru.*

## ***Transfer in San Martín***

After 11 years of work by Servicio Cooperativo Interamericano de Salud Pública in San Martín Department, in January 1958 we turned over the health unit to Peru's Ministry of Health. Since 1946 SCISP has gradually developed public health and medical care services for the 400,000 people living in this high, jungle area.

The health unit for San Martín consists of a 50-bed hospital and health center in Tarapoto, a health center in Moyobamba, medical posts in Lamas, Rioja, Juanjui, and Saposoa, and 15 health posts in the smaller towns. In accepting responsibility for the health service, the government of Peru assumed a yearly financial obligation of approximately \$130,000, or 3.5 million soles.

—FREDERICK J. VINTINNER, Sc.D., M.P.H., *chief, Division of Health and Sanitation, U. S. Operations Mission, Peru.*

## ***The Road Back***

The small government hospital in Voinjama, district and provincial headquarters of Liberia's Western Province, is the center of a proposed project to combat sleeping sickness. Because the trucks that brought supplies to the hospital often took a week to get there from Monrovia, the capital, and this transportation cost \$350, I decided to investigate the logistics of providing services to Voinjama myself.

I made the 200-mile trip to Voinjama in 2 hours in a light plane, but returning to Monrovia in a 4-wheel drive jeep took far longer. The road back goes through French Guinea so visas and re-entry permits had to be arranged. The first leg of the jeep journey ended at Macenta, 36 miles and 4 hours from Voinjama. We were told we had made excellent time; frequent rains turn the laterite of the roads into mud paste, but our jeep was stuck only once, in front of the French customs station.

On this trip I developed an essential skill, bridge building. The ordinary ones are made of logs placed lengthwise across streams. Frequently the wheels of a truck force the logs apart and the truck tumbles into the stream or its axles are suspended on the logs.

After stopping overnight in Macenta, we left early the next morning for N'Zérékoré, still in French Guinea. On the way we crossed the St. Paul River.

Vehicles are ferried across its 100 yards on a hand-pulled barge, but travelers on foot use the famous "monkey bridge," constructed entirely of long vines twisted together to make two handrails connected by a sling. I stepped gingerly across the swaying span which tightens and dips at each step but ingeniously serves its purpose, except when rotting vines are not replaced.

We reached N'Zérékoré, the second overnight stop, after driving the 61 miles in 7 hours. Next morning we drove to Ganta on the Liberian side of the border and made the final leg of the journey to Monrovia in about 8 hours.

When the new road is completed, getting supplies to Voinjama will not be so difficult, and air service to the town may soon be started by Liberian National Airways.

—JAMES P. WARD, M.D., *chief public health and sanitation division, U. S. Operations Mission, Liberia.*

## ***The Spring***

Rurrenabaque, a little town in the jungle uplands of Bolivia, was not far from a clear spring at the base of a cliff which could amply serve 5,000 people. The spring was high enough to feed the town by gravity flow. But the people could scarcely reach the spring on foot and Servicio engineers faced formidable obstacles to bring the water to the town in channels.

No road from La Paz, 150 miles distant, led to Rurrenabaque. Planes ferried in most of the equipment and materials needed to convert the spring into an accessible water supply. The dynamite for blasting came part of the way by truck and then by mule pack and canoe to the remote site.

No machines of any size could be used at the spring itself. Drilling for blasting operations had to be done by hand. The piers, heavy pieces of timber 25 feet long and each weighing more than a ton, had to be carried by men through the tropical forest. A human chain passed along the stones for the foundations of the piers.

After more than a year of such labor by the townspeople, the fresh, clear water of the mountain spring flowed into Rurrenabaque.

—HARALD S. FREDERIKSEN, M.D., *chief, health and sanitation division, U. S. Operations Mission, Bolivia.*

*A 20 percent reduction in the incidence of caries was obtained from one application of an 8 percent stannous fluoride solution.*

## Stannous Fluoride Clinical Study in Olmsted County, Minnesota

WILLIAM A. JORDAN, D.D.S., M.P.H., JOHN R. SNYDER, D.D.S., and VIKTOR WILSON, M.D., M.P.H.

**R**ESearchers have shown that stannous fluoride applied topically reduces dental caries (1, 2), and some of their studies have demonstrated that an 8 percent solution of stannous fluoride is superior to a 2 percent solution of sodium fluoride (3).

To provide further information on the value of stannous fluoride as a caries inhibitor, we selected all 7th and 8th grade students in the rural and village schools of Olmsted County, Minn., for our study. This group was the most accessible and also had the greatest number of permanent teeth. Of those eligible, 510 (95 percent), between the ages of 12 and 13, signed up for the study with permission from their parents or guardians.

The Rochester-Olmsted County Public Health Center was chosen as the examining and experimental site because the personnel in its health unit were interested and because its facilities were available. The study was planned to cover 2 years.

Cooperation was then obtained from groups involved or interested in the study: the Roches-

ter Board of Public Health and Welfare, the Olmsted County Board of Health, the Rochester Dental Society, rural and village school officials (including the county superintendent), parents (through the PTA), and teachers (at a teachers' institute). The teachers, who interpreted the facts of the study to students and parents, were indoctrinated at the institute, in an article in their newsletter, and by means of radio, television, and news releases. The county's public health nurses also aided in this respect. All contacts were made during the summer months before schools opened.

### Planning Committee

A planning committee composed of a health officer and the health educator of the Rochester-Olmsted County Health Unit, the staff of the Minnesota Department of Health Section on Dental Health, and public health nurses outlined a schedule of 50 examinations per half day. The scheduling was based on a school day which consists of 6 hours. This allowed approximately 3.6 minutes for each dental examination and the same time for the four X-rays taken by another public health dentist.

Since the students came from rural and village schools outside the city of Rochester, arrangements were made to transport them to the health center at specified times. Public health nurses informed all rural and village schools of the timetable and the means by which the

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*Dr. Jordan is chief, and Dr. Snyder is assistant chief, section of dental health, Minnesota Department of Health. Dr. Wilson is health officer for the Rochester-Olmsted County Health Unit. This study was sponsored by the section of dental health and the health unit and aided by a grant from the Public Health Service.*



children were to be transported. Teachers were also helpful here. In rural areas, parents provided transportation for the students; in the villages, school buses were used.

### Education

Since approximately 50 students were to be brought into the health center at a particular time and remain there for half a day, the health educator planned dental health classes for them. The students were divided into three groups, each designated by colored molars pinned to dresses and jackets, and while some students were passing through dental offices for X-rays and examinations, others were being rotated through classes on dental health, nutrition, and sanitation.

Following is a brief summary of the material presented in those classes:

- **Dental Health.** The objective of this class was to increase the students' interest in the proper care of their teeth. Class instruction included a review of the anatomy and general structure of teeth and emphasized the importance of having and maintaining good teeth. Theories and causes of dental caries were discussed along with the means by which tooth

decay may be prevented and controlled. Proper toothbrushing, selective diet, fluoridated water or topical application of fluorides, plus the most important factor, regular dental visits, were stressed as the principal factors in good dental health.

- **Nutrition.** The objective was to develop a favorable attitude toward a nutritionally balanced diet and an understanding of the kind and quantity of foods necessary for dental health. The nutritionist demonstrated with prepared meals the seven basic food groups (see illustrations) and pointed up the value of a good breakfast. Students were taught to select as afternoon snacks such foods as fresh fruits, fruit juices, carrot sticks, celery, and milk that leave the mouth quickly and are less cariogenic than sweets, which are normally eaten.

- **Sanitation.** Sanitarians showed tests of contaminated water supplies and explained how such supplies become contaminated. The importance of pasteurizing milk was presented. Other sanitation services that were described included restaurant inspection, nuisance abatement, mosquito control, and laws pertaining to offensive trades, such as the operation of slaughter houses.



The health educator used this dental display in summarizing proper toothbrushing, selective diet, fluoridated water or topical application of fluorides, and regular dental visits as the principal factors in good dental health.



**Practical help in setting up eating patterns for a day was given students participating in the Olmsted County, Minn., stannous fluoride study.**

Following an evaluation and summation of the three sessions, a dental health film, *The Gateway to Health*, was shown and discussed. The dental director briefly explained the future plans of the study and what was expected of each student.

In an effort to obviate the use of any fluoridated toothpaste by members of the control and experimental groups, a nonfluoride dentifrice was distributed among them before they returned to their schools. The students were able to obtain additional supplies from the county's public health nurses when the nurses visited the schools, or by coming directly to the health center. Records were kept on the distribution of the toothpaste.

#### **Procedures**

The students were assigned in groups of 50 per half day for examinations and X-rays. All received a complete mouth mirror and explorer examination from Dr. William A. Jordan, who used a Burton lamp to illumine mouths adequately. Two posterior bitewing X-rays and one upper and one lower X-ray of the anterior teeth were taken by another public health dentist.

In order to start this study on relatively even terms, the students were divided into two groups comparable in caries experience. The control group had a mean of 9.582 decayed, missing, or filled (DMF) teeth and a mean of 16.373 decayed, missing, or filled (DMF) sur-

**Table 1. Incidence of caries after a single application of 8 percent stannous fluoride solution to erupted permanent teeth of children 12-13 years of age, at the end of 1 year**

Location of new caries	Control group (N=238) <sup>1</sup>	Experimental group (N=234)	Difference between groups	Reduction in percent	P
Teeth.....	2.15 ± 0.112	1.72 ± 0.108	0.43	20.0	0.0052
Surfaces.....	4.79 ± 0.229	4.10 ± 0.221	.69	14.41	.0308

<sup>1</sup> Some teeth thought to be carious when first examined were subsequently found to be noncarious. The incidence of reversed diagnosis was 0.265 for the control group and 0.360 for the experimental group.

faces, as compared with means of 9.560 DMF teeth and 16.240 DMF surfaces for the experimental group. The two groups were practically identical with regard to DMF teeth and surfaces.

Following the initial examination the students were rescheduled for treatment at the rate of 12 to 14 per day, and the information was sent to their schools. Conscientious cooperation of parents in the rural areas helped keep the schedules running as planned. Cancellations or changes in time by individual students were practically nil.

The treatment began with prophylaxis by the hygienist. The teeth in one half of the mouth, upper and lower quadrant, were isolated by cotton rolls, with holders used to keep the rolls in place. A continuous roll was used on the buccal side for the upper and lower teeth. The teeth were then dried by compressed air.

During this procedure the assistant prepared a fresh solution of 8 percent stannous fluoride by dissolving 0.8 gm. of stannous fluoride in 10 cc. of distilled water.

The solution was applied to the clean, dry teeth by a cotton swab, and the teeth were kept wet for 4 minutes. A timer was used to assure uniform applications. The other half of the

mouth was then treated in the same manner. It requires approximately 30 minutes to give a good prophylaxis and a complete topical application of stannous fluoride.

The control group received prophylaxis followed by a water treatment under the same procedure as the treated group.

(An agreement was made with the parents and students of the study that if the study produced favorable results all the students in the control group would receive treatment at the end of the study if they desired.)

#### Followup Examination and Findings

At the end of the first year, the same public health dentist conducted a followup examination in the same manner as the original examination. Nearly as much time was devoted to planning schedules and appointments for this series as for the original series. A followup session devoted to dental health education was also planned to evaluate the first educational program.

Of the 510 students originally examined, 472 were reexamined, 238 in the control group and 234 in the experimental group. As table 1 shows, 20 percent fewer new dental caries were

**Table 2. Comparison of caries in surfaces of teeth of experimental and control groups following single application of 8 percent stannous fluoride solution to erupted permanent teeth of children 12-13 years of age at the end of 1 year**

Surface	Control group (N=238)	Experimental group (N=234)	Difference	Differences in percent	P
Proximal.....	2.96 ± 0.169	2.35 ± 0.143	0.61	20.60	0.0052
Occlusal.....	1.24 ± 0.097	0.98 ± 0.088	.26	20.96	.0478
Buccolingual.....	0.59 ± 0.054	0.77 ± 0.082	-.18	-30.50	.0672



found in the experimental group than in the control group. The probability of .0052 indicates 20 percent is statistically significant. Surfaces of teeth in the experimental group were 14.1 percent less carious than in the control group.

Table 2 shows the difference in the incidence of caries between the two groups with regard to specific DMF surfaces. The proximal surfaces of the treated group were 20.6 percent less carious than the same surfaces of the untreated group. This is statistically significant. The occlusal surfaces in the treated group showed a 20.96 percent reduction as compared with the control group. The probability of .0478 is just barely significant.

There was a reverse result, inexplicable at present, in the buccolingual surfaces where 30 percent more caries were found in the experimental group than in the control group. The analysis at the end of the second year may shed some light on this situation.

In conjunction with the educational feature of the study at the followup examination, the children were given an evaluation checksheet on the subject matter presented the previous year. The children, from five different schools, answered between 70 and 75 percent of the questions correctly. Since there was no original evaluation of the education on dental health, nutrition, and sanitation, no comparisons could be made.

### Summary and Conclusion

An 8 percent stannous fluoride solution, applied once to erupted permanent teeth, was

tested in students aged 12 and 13 years in Olmsted County, Minn., to determine the solution's ability to inhibit caries for 1 year. The 510 students were divided into almost identical control and experimental groups. At the end of 1 year, 472 students returned for examination. Compared with the control group, the experimental group had 20 percent fewer carious new teeth and 14.5 percent fewer new carious surfaces. Proximal and occlusal surfaces benefited from the treatment.

A second application of the solution was made at the end of the first year and its effects will be studied this year.

The students were briefly schooled in dental health, nutrition, and sanitation simultaneously with the examinations at the Rochester-Olmsted County Public Health Center. One year later the children were able to answer correctly between 70 and 75 percent of the questions put to them on the subject matter taught.

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## Research Fellowships in Clinical Nutrition

Ten fellowships for research in clinical nutrition are being offered to medical students by the Nutrition Foundation, Inc., in cooperation with the Council on Foods and Nutrition of the American Medical Association. The fellowships are designed to stimulate a more active interest in the science of nutrition among staff members and students of schools of medicine.

Each fellowship provides \$200 monthly for the student for not more than 3 months of the nonacademic year. Grants will be awarded on the recommendation of a senior investigator, who should make written application to the Council on Foods and Nutrition, American Medical Association, 535 North Dearborn Street, Chicago 10, Ill., by December 15, 1958.

# *Status of* **TUBERCULOSIS**

## CONFERENCE REPORT

Tuberculosis, still one of this country's most costly infectious diseases, engaged the attention of 3,000 physicians, public health workers, and nurses at the 1958 annual meetings of the National Tuberculosis Association and its medical section, the American Trudeau Society, and of the National Conference of Tuberculosis Workers. The meetings were held concurrently May 19-22 in Philadelphia.

Although tuberculosis was the focal point of the meetings, nontuberculous diseases of the lung and cardiovascular diseases also were discussed, reflecting the broadening interests of the groups. Following a brief summary of tuberculosis facts and figures compiled by the National Tuberculosis Association, highlights of selected scientific papers are presented.

### **Tuberculosis Facts and Figures**

★ Approximately 800,000 people in the United States have tuberculosis, either active or inactive, but in need of medical supervision.

★ Between 50 and 55 million people are infected with the tubercle bacillus.

★ Approximately 90,000 new cases are reported each year, almost 70,000 of which are active cases.

★ The disease causes about 14,000 deaths a year.

★ Tuberculosis costs the United States approximately \$725 million a year, according to a study by the Public Health Service based on 1956 figures.

★ Three principal drugs used in treating tuberculosis are, in the order of discovery, strep-

tomyacin, para-aminosalicylic acid (PAS), and isoniazid. Usually two of the drugs are given the patient, but in some cases isoniazid is given alone.

★ Because none of these drugs kills all the tubercle bacilli, because of the phenomenon of drug resistance, and because some patients do not respond to treatment with these three drugs, one of the great needs in tuberculosis therapy is for improved medication.

★ Among the drugs of limited usefulness are pyrazinamide, viomycin, and cycloserine. A new drug is kanamycin.

★ The use of drugs to keep infection under control and the development of new surgical techniques have made it safer to remove diseased areas of the lung which might become foci of new infections.

★ Drugs have also been the key factor in the current trend of treating tuberculosis in medical centers rather than in remote sanatoriums. Since drugs bring infection under control at an earlier date than was formerly possible, the danger of spread of disease by patients under treatment has been lessened. The danger of spread of disease by the unknown, untreated case is as great as ever. Tuberculosis is spread primarily by patients with active disease who cough up tubercle bacilli.

★ The tuberculin skin test and the chest X-ray are the principal instruments for finding tuberculosis. The tuberculin test does not reveal active disease, but it does reveal infection by tubercle bacilli. It is a sensitive index of the danger spots in the community.

★ If a person reacts to a tuberculin test, a chest X-ray is advocated. The chest X-ray is also indispensable to the physician in following the course of the disease, and it may also be used as the primary casefinding technique in many circumstances among adult population groups.

★ A serologic test which may prove valuable in the diagnosis of active disease has recently been developed by scientists at Northwestern University School of Medicine, and is now under extensive study.

★ BCG vaccination for certain groups of the population who are more than normally exposed to tuberculosis is advocated by the American Trudeau Society. It is given only to

persons who are tuberculin negative. Thus the persons in greatest need of protection—the tuberculin positive, among whom most of the tuberculosis occurs today—are ineligible for vaccination with BCG.

★ Studies are underway to determine the possible value of isoniazid as a prophylaxis.

★ A vaccine which could be given to the entire population and which would not destroy the value of the tuberculin test (as does BCG) is among the great needs in the tuberculosis eradication program. Among the other questions for research are how tuberculosis drugs work, how the function of the lung can be preserved despite disease, and a better understanding of the tubercle bacillus itself.

### **Natural Resistance and Therapy**

The popular belief of Hippocrates' day that tall, fair men are more susceptible to tuberculosis than short, dark men may not be so wrong as modern-day scoffers would have us believe, according to Dr. Esmund R. Long of Pedlar Mills, Va., in the Amberson Lecture. Dr. Long is emeritus professor of pathology, University of Pennsylvania, and was formerly director of medical research for the National Tuberculosis Association and director of the Henry Phipps Institute.

Discussing the supporting structure of immunity in the therapy of tuberculosis, Long pointed out that recent studies on military personnel appear to bear out the ancient concept.

"The unexpressed thought seems to be that the characteristics named are genetically linked with other factors that are truly pertinent to native resistance," he said. Among these factors are hormones.

It has long been recognized, Long observed, that people with insulin deficiency have low resistance to tuberculosis, while those with an excess of thyroid hormone are not prone to the development of the disease.

As for the steroid hormones of the adrenal glands, cortisone, in suppressing inflammation, may be beneficial in some forms of tuberculosis, particularly meningitis, and detrimental in others. The important point, Long explained, is that cortisone does modify resistance; therefore, physiological differences in the body's



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### Eternal Verities

- The tubercle bacillus is still the cause of tuberculosis. The primary attack must be here and not diverted too much to secondary factors.
- The disease is still communicable from man to man and from animal to man.
- The tuberculin test is still the best means of locating tuberculous infection whether in the individual or the community.
- Tuberculosis still occurs essentially as a family epidemic, and epidemiology must start with the family unit.
- Tuberculosis is still an insidious and chronic disease; its early stages are asymptomatic. Vigilance is still necessary to detect the disease in its earliest stages.
- In spite of shortened periods of hospitalization, the disease still represents an economic drain in money and time.
- The disease is still socially disrupting in its effects on the family, on employment, and so on.
- Everybody is vulnerable regardless of age, sex, race, or social stratum.

—HERMAN KLEINMAN, M.D., *from a paper delivered at the annual meeting of the National Tuberculosis Association, Philadelphia, Pa., May 19-22, 1958.*

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production, which may occur as a result of a variety of stresses or strains, can be highly significant. Maintenance of a proper balance of cortisone would be the objective, Long indicated.

Possibly affecting hormonal balance but perhaps operating in some other fashion, mental attitudes have been described many times as favoring or controlling the progress of tuberculosis, Long said. To some they seem to be as vital as the use or non-use of chemotherapy.

The attitudes Long mentioned included anxiety, complacency, willpower, determination, cooperativeness, hostility, care, and carelessness.

Other factors that seem to influence resistance to tuberculosis are nutrition, other diseases and even accidents, and biochemistry, according to Long.

Dr. Max B. Lurie, of the Henry Phipps Institute, emphasized the influence of the thyroid

on resistance to tuberculosis. He reported that thyroid hormones markedly suppress activity of tuberculosis in rabbits, while propylthiouracil (a thyroid depressant) and removal of the thyroid gland have the opposite effect.

Lurie also reported that production of antibodies against a nonspecific antigen (bovine serum albumin) can be "markedly enhanced" by a thyroid hormone in some rabbits.

### Protective Measures

Clean air is the best safeguard against the spread of tuberculosis, advised Dr. Richard L. Riley, associate professor of environmental medicine, Johns Hopkins University, Baltimore.

Riley suggested specifically, in order of decreasing importance, "air purification by ultraviolet irradiation, ventilation with plenty of fresh air, avoidance of crowding, covering coughs and sneezes, spitting into a handkerchief, and use of masks" as protective measures in hospitals.

People catch infectious diseases when infectious material becomes implanted on types of tissue on which it can grow, not simply by touching the material, he explained. Lung tissue is extremely susceptible to the tubercle bacillus; the skin, the upper respiratory tract, and the alimentary tract are much less so.

Hence, it is the small droplets, so tiny that they can be seen only in photography taken with special illumination, that are the culprits, according to Riley. These droplets, produced in large numbers by coughing, sneezing, spitting, laughing, and talking, evaporate in a fraction of a second, leaving dried residues called droplet nuclei. The droplet nuclei are small enough to float about on air currents and can be inhaled deep into the lungs where they are deposited.

Animal studies that have shown promising results with a tuberculosis vaccine were reported by Dr. H. Stuart Willis, of Chapel Hill, N. C. He said that a vaccine made from an attenuated strain of tubercle bacilli known as R<sub>1</sub>R<sub>v</sub> had offered more protection to guinea pigs than BCG vaccine. Co-authors of the paper were H. M. Vandivere and Margaret R. Vandivere, also of Chapel Hill.

Animal experiments have also indicated that a limited degree of immunity to tuberculosis can be transferred by cells from vaccinated animals. These experiments were discussed by Dr. Emanuel Suter, University of Florida College of Medicine.

When monocyte cells from immunized animals were infected with tubercle bacilli, the multiplication of the organisms within the cells was restricted, Suter said, and, furthermore, protection was given mice injected with cells from immunized animals.

These results, Suter declared, show that washed cells from vaccinated animals can induce a limited degree of infection immunity. The limited protection suggests that a complex mechanism is responsible for acquired resistance in tuberculosis. Experiments by others using serum from vaccinated animals point in the same direction, he added.

#### **Drug Therapy and Hospitalization**

Development of resistance to kanamycin was reported by Dr. Kenneth Wright, Onondaga Sanatorium, and Dr. Attilio Renzetti, Joseph Lunn, and Dr. Paul Bunn, department of medicine, State University of New York, Syracuse. This drug, made from a mold akin to that from which streptomycin and neomycin are derived, was discovered in Japan by Dr. Hamao Umezawa of Tokyo University.

Reporting on use of the drug with 12 patients who had not improved under other drug therapy, Wright said that by the end of 90 days the tubercle bacilli of all patients had become resistant to the drug, although there was X-ray and symptomatic evidence of improvement in 4 patients. The resistance, he added, was about the same as that observed with streptomycin when this drug was used alone.

Whether the use of another drug with kanamycin will delay development of resistance has not been determined, Wright said. He believes that further study with the drug is indicated.

A combination of cycloserine and viomycin may prove beneficial to patients who do not respond to isoniazid, streptomycin, and PAS, according to Dr. William S. Schwartz and Dr. Ralph E. Moyer, of the Veterans Administration Hospital, Oteen, N. C. Experience with

57 patients with moderately or far advanced disease who had failed to respond to other drugs indicates that the regimen may be the most promising "secondary regimen" so far tried.

A simple method of keeping track of how the individual patient is responding to isoniazid was described by Capt. Robert L. Taylor, Fitzsimons Army Hospital, Denver. Such a procedure is needed because patients vary in the way they metabolize the drug. Some break it down chemically and others excrete it without change. The latter derive the greater benefit.

For the rapid metabolizers, it may be practical to give larger doses than usual, Taylor said. After the patient's use of the drug is determined by a bioassay technique, the blood levels of isoniazid in the patient as the dosage is increased can be determined by simple chemical analysis, according to Taylor.

Despite the wonders of antibiotic and chemical therapy, "treatment of new cases of tuberculosis is best begun in the hospital," asserted Dr. Frances S. Lansdown, Dr. Julia Jones, and Fannie Behlen, of Bellevue Hospital, New York City. Their conclusion was based on a survey of more than 600 patients who had received care through the outpatient clinic of Bellevue, most beginning treatment in the hospital.

Initial treatment in the hospital facilitates complete clinical evaluation, allows careful observation during early periods of therapy when drug reactions most frequently occur, and minimizes the dangers of infection of associates in the home, they said.

Concerning the danger of infecting others, it was found that 42 patients discharged tubercle bacilli longer than 4 weeks, while the rest either had positive sputum for only a brief period or were sputum negative throughout the course of treatment outside the hospital.

#### **Surgical Treatment**

Major surgery for tuberculosis, even removal of an entire lung, does not prevent safe childbirth, according to an obstetrician, Dr. George Schaefer, of Cornell University Medical College. He reported on the safe delivery of 32 babies to 29 tuberculosis patients who had been

operated upon either before they became pregnant or during their pregnancy. The operations included removal of a lobe of the lung, removal of a segment of a lobe, and collapse of the lung by a thoracoplasty.

In all instances antimicrobial drugs were given the mother without harm to the child, said Schaefer, but in no instance was the mother permitted to nurse her baby.

Chicago surgeons T. W. Shields, W. M. Lees, and R. T. Fox reported a followup study of 101 persons who had had a lung removed between 1951 and 1955 because of tuberculosis. They found that 11 of the patients died within 60 days of the operation and another 5 died within a year as the result of complications. Nonfatal complications occurred in 18 patients. The majority of the patients, 57, had uneventful postoperative courses.

For patients who have difficulty in breathing because of chronic lung disease, a "window" that will open and close can be carved in the windpipe. Construction and operation of the window were described by Dr. Edward Ernest Rockey, clinical instructor in surgery, New York Medical College, New York City.

The window is cut in the front wall of the trachea and can be reached from the outside through a skin tunnel. The tunnel is entered between two doorlike skin valves located over the front of the neck.

The procedure, used mainly on patients with emphysema, permits access to the tracheobronchial tree so that secretions can be aspirated and medication applied by the patients, according to Rockey. Of the 6 on whom it has been tried, 2 have improved sufficiently to leave the hospital for the first time in years.

Co-authors of the report were Dr. Samuel A. Thompson, New York Medical College; Dr. Charles F. Blazsik, St. Anthony's Hospital, Woodhaven, N. Y.; Dr. Edgar Mayer, New York University Postgraduate Medical Center; and Dr. Israel Rappaport, Columbia University College of Physicians and Surgeons.

### Mimics of Tuberculosis

A disease caused by "atypical" mycobacteria that mimic the tubercle bacillus but are distinct from it has been reported among 100 pa-

tients in Florida hospitals. The disease in these patients was discussed by Dr. Albert G. Lewis, Jr., Frank P. Dunbar, Dr. Eunice M. Lasche, and Dr. Ernest N. Lerner, of Tampa; Dr. Robert J. Davies, of Tallahassee; and Dr. Dwight J. Wharton and Dr. James O. Bond, of Jacksonville.

All the patients had chronic pulmonary disease, but the organisms recovered from their sputum had characteristics different from the tubercle bacillus. The bacilli were grouped as photochromogens (yellowish when exposed to light); nonphotochromogens (without color); scotochromogens (yellowish in the dark); and unclassified.

Most of the atypical organisms were resistant to isoniazid and PAS and were partially resistant to streptomycin, according to the Florida report. Treatment was highly effective in patients from whom photochromogens and scotochromogens were recovered, but not so effective among those infected with nonphotochromogens.

"Clinically, radiologically, and pathologically," the report stated, "the cases are indistinguishable from tuberculosis."

Sarcoidosis, another mimic of tuberculosis, was the subject of a symposium. A mimic also of cancer, this lung disease is of unknown origin. The highest prevalence, according to Dr. John S. Chapman, professor of medicine, Southwestern Medical School, University of Texas, is in the southeast. Also, it is found more frequently among Negroes than among whites and is rare in the Chinese and in American Indians, he stated.

Although the steroids—prednisone and prednisolone—do not cure sarcoidosis, they have a suppressive action that may be beneficial "in selected instances where the unremitting course of the disease is producing loss of organ function or is even life threatening," stated Dr. Louis E. Siltzbach, Dr. Mark M. Imberman, and Dr. Howard Grossman, of Mount Sinai Hospital, New York City.

### Other Chest Diseases

A negative association between physical activity and coronary artery disease at a young age was suggested in a report by Dr. David M.



Spain, a pathologist at Beth-El Hospital, Brooklyn, and Dr. Victoria A. Bradess, medical examiner of Westchester County, N. Y.

The apparent reason is that "activity promotes the development of collateral circulation," they indicated. In other words, the blood vessels of the active man are in a condition, because of exercise, to take over a major role in the circulatory system.

The report was based on a postmortem study of 1,500 sudden deaths in Westchester County during an 8-year period. Deaths from coronary occlusion were classified according to occupation, regardless of economic status. The data, Spain and Bradess specified, showed that the men in sedentary positions had died at a younger age than the men who led a more active life.

To determine whether this might mean that there had been an increase in coronary artery disease or that more inactive than active people had atherosclerosis and thrombosis, they analyzed data on the amount of atherosclerosis among men of comparable age groups who had died suddenly from accidents. They found no significant difference in the amount of coronary atherosclerosis in the various age groups in relation to differences in occupational physical activity.

In another paper, pathologists from several cities reported a new lung disease. Characterized by a stoppage of the alveoli with a protein-like material rich in fats, the disease has been tentatively designated "alveolar proteinosis," according to Dr. Samuel H. Rosen, of the Veterans Administration, assigned to the Armed Forces Institute of Pathology, Washington, D. C.

Co-authors were Dr. Benjamin Castleman, of Massachusetts General Hospital, Boston; Dr. Averill A. Liebow, of Yale University Medical School; Dr. Frank M. Enzinger, also of the Armed Forces Institute of Pathology; and Dr. Richard Thomas N. Hunt, of Massachusetts General Hospital.

Diagnosis was based on biopsy material or autopsy specimens from 25 patients from all sections of this country and (one each) from

Canada, England, and Italy. Although the first case was observed at Massachusetts General Hospital 5 years ago, Rosen said that most of the cases have been seen within the past 3 years.

There have been 8 deaths. In 3 of the patients who died, a fungus disease was superimposed on the original condition, Rosen said.

At the onset of illness, there are in some instances symptoms usually associated with pneumonia. The most common complaint is shortness of breath, usually with cough, he added.

No micro-organism has been detected that can be considered the causative agent. It is assumed that the disease is due to inhalation of a foreign substance, but the only clue, according to Rosen, is that 4 of the patients worked in lumber yards and 2 were electricians.

Treatment with antibiotics or corticosteroids does not appear to alter the course of the disease, and since the disease spreads through both lungs, surgery is not possible, said Rosen.

### Lung Cancer

A method of producing cancer of the lung in animals in order to study suspected carcinogens was reported by Dr. Marvin Kuschner, director of pathology, Bellevue Hospital, New York City.

Pellets containing known carcinogens were implanted in the bronchi of rats through an opening made in the windpipe. Following implantation, Kuschner said, squamous cell tumors, the type usually found in cancer of the lung, originated in the bronchus around the pellet and extended into the neighboring lung.

Chemicals used in experiments so far have included, he said, polycyclic hydrocarbons, methylcholanthrene, dibenzanthracene, and benzyrene. Studies are now underway to determine if lung cancer can be produced by this technique with components of tobacco tar, compounds of chromium, and ionizing radiation.

Co-authors of the paper were Dr. Sidney Laskin and Dr. Norton Nelson, department of industrial medicine, New York University.

# Health Departments and Prevention of Motor Vehicle Accidents

ALBERT P. ISKRANT, M.A.

**T**HE MOTOR VEHICLE is the chief cause of accidental death in every age group from 1 to 65 years and outranks any other cause of death in the age group 5 to 30.

Motor vehicle accidents annually kill approximately 40,000 persons, injure approximately 5 million, and cause the loss of 100 million man-days. These accidents injure 1 out of every 10 males between the ages of 15 and 24 and cause 40 percent of all deaths of males in that age group. In the group aged 15-24 years, the proportion of motor vehicle deaths in relation to all deaths has risen phenomenally. Pronounced but less drastic increases are seen in the groups 5-14 and 25-34 years old (fig. 1).

The pattern of nonfatal injuries caused by motor vehicles is similar to the pattern of deaths, being highest in the age group 15-24 years. The estimated number of nonfatal injuries in the United States for the period July-December 1957 is shown in table 1, and the estimated annual injury rate for motor vehicle accidents, in table 2.

On the basis of the mortality and injury data available, motor vehicle accidents would certainly appear to qualify as a public health problem, which it is believed is amenable to the epidemiological approach used in other public health problems. Because of their knowledge of epidemiological procedures and

other programs health departments can contribute to the solution of this health problem in a number of ways.

## Epidemiological Approach

The epidemiological approach consists of finding out the who, how, where, and when of accidental injuries and deaths, and, if possible, the why. It includes five steps: collection and analysis of data, examination of apparent relationships, establishment and testing of hypotheses, development and testing of control measures, and incorporation of tested measures into prevention programs.

At present there is not to my knowledge any full-scale epidemiological study of motor vehicle accidents being carried out in the United States. One is planned by the traffic institute of Northwestern University, using an interdisciplinary team consisting of a physician, an engineer, and a social scientist, and an epidemiological study of the automobile accidents of adolescent drivers is planned for joint execution by the Harvard Medical School and the Harvard School of Public Health. Several completed studies have been referred to as epidemiological, but these are concerned solely with the host or with human factors.

## Host and Human Factors

As with most of the diseases, the mortality rate for motor vehicle accidents is higher for males than for females. The chief toll is among young males in the prime of life, although one-fifth of the deaths from motor vehicle accidents

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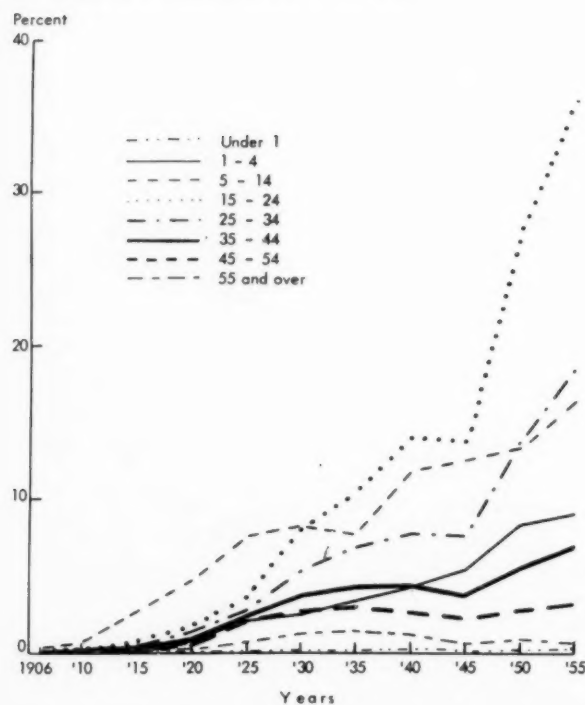
*Mr. Iskrant is chief, Operational Research, Accident Prevention Program, Division of Special Health Services, Public Health Service. This paper was presented at the 24th New England Health Institute, University of Connecticut, Storrs, June 20, 1958.*

are among pedestrians, and deaths of elderly men and children under 10 years of age contribute greatly to this number. In general, death rates are higher for nonwhite than for white persons. Exceptions are the rates for the age group 15-24, and the group over 75 years old. Married persons, especially men, have lower death rates from motor vehicle accidents than any other marital status group. Rates for divorced men are considerably higher than for other groups (fig. 2).

Health workers generally agree that further knowledge of the human factors in accident causation is needed before significant advances in highway accident reduction can be achieved. Existing knowledge on this subject has been summarized by McFarland and his co-workers (1).

The question of "accident proneness" has been explored at length, but sporadically. More than 20 years ago a review of the accident experience of approximately 30,000 drivers in Connecticut showed that a group of less than

**Figure 1. Deaths from motor vehicle accidents as percentage of deaths from all causes, by age groups, United States, 1906-55.**



SOURCE: Basic data from National Office of Vital Statistics.

**Table 1. Estimated incidence of motor vehicle injuries, July-December 1957, continental United States**

Age, in years	Both sexes	Male	Female
All ages-----	2, 444, 000	1, 346, 000	1, 097, 000
Under 15-----	281, 000	104, 000	175, 000
15-24-----	748, 000	482, 000	265, 000
25-44-----	710, 000	387, 000	323, 000
45-64-----	491, 000	284, 000	207, 000
65 and over-----	209, 000	85, 000	124, 000

NOTE: Detailed figures may not add to totals because of rounding.

SOURCE: National Health Survey data, July-December 1957.

4 percent of the operators had 40 percent of the fatal accidents, 36 percent of the injury accidents, and 38 percent of the noninjury accidents (2). In 1938 the Wichita, Kans., police department did a study of accident repeaters. Their findings have been reported in an unpublished monograph. In the intervening 20 years the number of studies to determine the characteristics of accident-prone individuals, or accident repeaters, has been legion.

The concept of accident proneness as an innate, immutable characteristic is giving way to the opinion that, because of mutable characteristics, some people in a group sharing the same environmental risks are more "susceptible" to accidents than are others in the same group. Personal factors being investigated may be conveniently divided into behavioral and attitudinal characteristics, health and physical characteristics, and effects of temporary conditions caused by such factors as alcohol, smoking, drugs, medication, and fatigue.

#### *Behavior and Attitudes*

Studies to determine the characteristics of chronic traffic law violators and accident repeaters have been many and varied, both in the armed services and in civilian groups. While gross relationships appear, many of the findings are conflicting. Moreover, application of the findings to control programs is difficult.

A study based on findings in the armed services is underway in Denver, where tests are being administered to high school children in an effort to find the factors which "discriminate" between safe and unsafe drivers. Researchers



have found that immaturity, lack of hostility restraint, lack of stability, absence of tension tolerance control, and aggressiveness are some of the personality characteristics associated with an excessive number of accidents.

Several studies are currently in progress to develop "scales" for measuring these personality traits. It is hoped that the knowledge gained can be incorporated into driver education and other safety programs. The health department can make a definite contribution to the prevention of motor vehicle accidents by promoting and assisting with driver education courses and driver improvement clinics and by helping to translate the results of research into practical education programs.

Studies are being planned and carried out on methods of changing or modifying behavior through the group approach, and otherwise. Corollary studies are needed on the relationship between attitudes and knowledge of safety laws and measures and between attitudes and behavior. Of particular importance in this regard are the studies on the attitudes and behavior of elderly people and on methods of modifying them, since elderly pedestrians have a very high death rate.

#### *Physical and Sensory Defects*

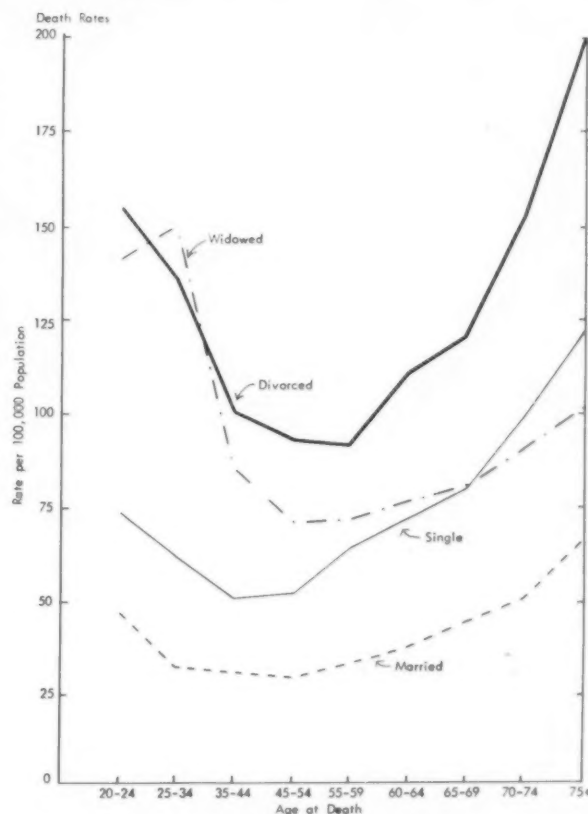
It apparently is generally agreed that organic disease, impaired functions, and aging processes increase the accident potential of persons, but the effect of these conditions on actual accident occurrence is, at present, speculative. The extent to which these persons "compensate" for their deficiencies is not known, and differences in "exposure" make comparisons difficult. One

**Table 2. Estimated injury rate for motor vehicle accidents per 1,000 persons per annum, by sex and age, continental United States**

Age, in years	Both sexes	Male	Female
All ages.....	29	33	25
Under 15.....	11	8	14
15-24.....	72	100	47
25-44.....	31	35	27
45-64.....	29	34	23
65 and over.....	29	26	32

SOURCE: National Health Survey data, July-December 1957.

**Figure 2. Death rates from motor vehicle accidents for males, by age and marital status, 3-year average, continental United States, 1949-51.**



SOURCE: National Office of Vital Statistics.

of the problems in the study of accident causation is to select groups which are exposed to constant risk and to observe them long enough to obtain meaningful data.

Employers of persons who will be exposed to high risk of accident can accept presumptive evidence of physical impairments in making their decisions concerning the hiring of applicants. Therefore, employers may accept a list of conditions which would be bars to employment as drivers of commercial vehicles, and licensing agencies may refuse to issue licenses to persons having these conditions. Refusal of permits to private drivers is, however, another question, and the evidence of the effect of a condition or defect must be more unequivocal than now exists for many of them before they can be refused licenses to drive. Studies of the effect of all types of conditions

and impairments on accident frequency and severity are badly needed.

The accident experience of a group of persons with an impairment might be compared with the experience of a control group free from that impairment, matched by age, exposure, and whatever other variables are recognizable. A corollary study should be made on the methods of keeping records of physical condition and the details of accident causation. Because of the difficulty of selecting appropriate groups with particular defects and following their accident experience, it may be more appropriate to give complete physical examinations to a sample of drivers applying for new licenses and of older persons applying for renewals of existing licenses at a particular center. Additional tests for attitudes may also be included. By making a complete followup of drivers who are examined and selecting an appropriate control group without the defect or impairment of these drivers, the same series of observations could be used for testing various hypotheses.

#### *Effect of Temporary Conditions*

Temporary states and conditions which cause a reduction in mental awareness or diminished reflexes obviously result in an increased liability to accidents. Unquestionably, persons who are under the influence of alcoholic beverages are more likely to have accidents than those who are not, but what is the effect of low levels of alcohol present in the blood some time after drinking?

The effect of smoking on drivers of automobiles is not clear, especially when smoking is combined with carbon monoxide and with high altitudes. The effects of various drugs on human efficiency are also not entirely known, either as to undesirable side effects or induced mood changes.

When automobile drivers fall asleep, it is obvious that fatigue is accident inducing, but other aspects of fatigue are not as clear. More work needs to be done on so-called operational fatigue, which has been stated to be partly the result of frustration and conflict within the individual.

Needed studies of the effects of these various factors include: the effect of certain drugs on social behavior and emotions, and consequently

on accidents; the relationship of sleep and dozing to accident occurrence and the value of certain remedial measures; the relationship of temporary attitudes to the occurrence of accidents; the phenomenon of "road hypnosis" and factors instrumental in causing it and in reducing it; and the relationship of operator performance to levels of alcohol in the body. Many planned studies aim at determining some of these relationships. The New York State Health Department, for example, proposes a broad study of the relation of personal factors to accidents and plans to use the knowledge gained for educational and licensing purposes.

For all studies relating variables to accidents, the construction and use of an automobile simulator of high sensory and motor fidelity, which could be used to produce a variety of experimental situations under controlled conditions, would be a distinct advancement. Such a simulator would allow observation of the behavior and reaction of the driver, with a view to discovering what he does under various conditions which may lead to accidents; under what conditions he is more likely to respond poorly; the deficiencies, either in him or in his environment, that may produce such hazardous behavior, or failure to behave; and in what ways such dangerous behavior may be corrected or avoided.

#### **Environment**

When we discuss environment, we ordinarily think of geographic distribution, and because the "rate per 100,000 resident population" best expresses the extent of any health problem, this rate is customarily used in calculating geographic distribution of diseases or injuries.

Rates of motor vehicle deaths or injuries by place of occurrence of accidents, however, are usually calculated per estimated number of miles driven in an area. This rate may be appropriate for estimating the risk of accidental death while driving, but for estimating a person's chance of being killed in a motor vehicle accident, the rate per population is the appropriate one. Parenthetically, the accidental death rate is the only rate for a major cause of death which is calculated with the "agent" of exposure as the base rather than the number of people at risk. We never calculate the ma-

laria death rate per 100 million mosquitoes or per square miles of swamp or the syphilis death rate per millions of spirochetes or other numerical measure of exposure.

An analysis of accidental deaths from motor vehicles, based on residence, reveals somewhat of a pattern. The 5 highest rates in 1956 were recorded for Wyoming, New Mexico, Montana, Arizona, and Idaho; the 5 lowest, for Massachusetts, Rhode Island, Connecticut, New Jersey, and New York. The "rate per miles driven" gives a somewhat different pattern and places Alabama, Louisiana, and South Carolina among the five States with the highest death rates from motor vehicle accidents. Apparently, driving is more hazardous in the south than in some other areas, although a person's chance of being killed in a motor vehicle accident are highest if he lives in the Rocky Mountain States. Based on fuel usage per capita in the United States, people in the western States drive more than those in the eastern States.

Weather is an environmental factor which obviously affects motor vehicle accidents. Because of lack of comparability of exposure data, statistics on the effect of weather, lighting, and road conditions are hard to evaluate, and the extent to which drivers compensate for obviously unsafe conditions is unknown. Statements in the newspapers, taken from gross statistics and indicating that most accidents occur on dry pavement on clear days and that the "safest time to drive" is between 2 and 4 a.m., are generalizations which have no practical value. Exposure data for rate calculations are needed in comparing the "risk" of driving under various circumstances. Fall and winter are, however, known to be the seasons of highest occurrence of accidental deaths from motor vehicles in the United States.

### Surveys and Records

Data on injuries are obtained chiefly from surveys and reports from various sources. The National Health Survey is providing data from which national and regional estimates can be made. The California Health Survey provides data about accidental injuries in California. The Connecticut State Department of Health is about to undertake a family injury survey,

which should provide a wealth of information on both highway and other accidental injuries in Connecticut.

Injury reports by hospitals and physicians can provide information useful to health departments. Worcester, Mass., has an injury reporting system in operation, and in New Bedford, Mass., childhood accidents are being reported. Some such measure of the incidence of injuries is necessary for the evaluation of preventive programs, educational or otherwise.

Accident records of traffic or motor vehicle bureaus are another important and sometimes overlooked source of information to health departments. The Georgia Department of Public Health is making a study of traffic accident records to determine their usefulness in developing programs of highway safety.

The National Office of Vital Statistics has designed supplements to the death certificate which are used from time to time by some State health departments to obtain more information on motor vehicle accidents than is now available from the death certificate.

### Program Evaluation

Program evaluation is a well-established procedure in all health departments. A requisite of program evaluation is a baseline of data from which to measure change. For example, if certain measures are instituted, do highway injuries and deaths decrease? Inherent in such evaluation is stability of statistics. Death statistics, of course, are comparable but may not be large enough to show meaningful trends in non-populous areas. Some type of injury measurement is necessary for determination of the results of programs of prevention of motor vehicle accidents.

### Secondary Prevention

For every death on the highway more than 100 persons receive nonfatal injuries. The emergency care given an injured person is an important factor in determining whether the injury results in death, permanent disability, or recovery. The care of injured persons usually consists of first aid, transportation, and medical management of injuries. Health depart-



ments could well concern themselves with local methods of administering first aid.

At Cornell University, significant research is being done into the aspects of the automobile which cause or accentuate injuries. As a result of their findings, the newer cars have incorporated into their designs features such as safety locks on doors, padded dashboards, recessed steering wheels, factory installed safety belts, and the like (3).

The design of the automobile is outside the control of health departments, but other methods of preventing or minimizing injuries following accidents merit their interest. Promoting the use of safety devices, including properly installed safety belts, would seem to be a legitimate concern of health departments.

#### Need for Cooperation and Research

Since highway accident prevention is a concern of various community agencies, official and voluntary, cooperation between the health department and these agencies is important. A committee of representatives from these agencies might increase the contribution of epidemiological techniques, program evaluation, and other public health and medical skills to the field of highway accident prevention.

Through epidemiological research health departments can offer a challenge to physicians and others to enter and remain in the field of public health. Research "is an important key

to the grand strategy of effecting change from the traditional in public health to the newer challenges . . ." (4).

#### Summary

Motor vehicle accidents are amenable to the same epidemiological approach as other public health problems.

No full-scale epidemiological studies of motor vehicle accidents are now in progress, but several are planned and more are needed.

Health departments can contribute to accident prevention and traffic safety in a number of ways. Among these are promoting and assisting with driver education courses and driver improvement clinics; helping to translate the results of research into practical education; promoting systems of first aid; promoting use of safety devices, including safety belts; and cooperating with official and voluntary community agencies.

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### Appointments in International Health

H. van Zile Hyde, M.D., has been appointed Assistant to the Surgeon General for International Health. Horace DeLien, M.D., succeeds him as chief of the Division of International Health, Public Health Service.

Dr. Hyde's duties include liaison with the Department of State and other governmental agencies concerned with international health. He will continue as United States representative on the Executive Board of the World Health Organization. Dr. Hyde has been chief of health activities in the Institute of Inter-American Affairs and in the Technical Cooperation Administration, chief of the Middle East Office of the United Nations Re-

lief and Rehabilitation Administration, and, for the last 5 years, chief of the Division of International Health.

Dr. DeLien has directed the health program of the International Cooperation Administration in the Philippines for the past 7 years. In the extensive reorganization of the Philippine health services, he helped establish rural health units throughout the islands, rehabilitate 61 government hospitals, and provide training for public health personnel. Before going to the Far East, Dr. DeLien was associate chief of health activities, Bureau of Indian Affairs, for 8 years.



Members from 12 States attended the ninth annual meeting of the Middle States Public Health Association, April 28-30, 1958, in Milwaukee, Wis. The following pages carry summaries of five of the papers presented at the conference.

### Proposes New Category For Nonparalytic "Polio"

Minnesota's 1955-57 experience with virus diseases of the central nervous system has put epidemiologists and physicians through an exciting time, according to Dr. Herman Kleinman, chief, section of chronic diseases, Minnesota Department of Health.

The poliomyelitis surveillance unit of the State health department was established in 1955 primarily to watch, through detailed epidemiological and laboratory work, the course of poliomyelitis when the Salk vaccine was first used in Minnesota. Necessarily the unit also surveyed aseptic meningitis.

The term "aseptic meningitis" is used, Kleinman stated, to mean not a specific disease entity but a syndrome common to many entities

whose responsible agents include viruses, which primarily concern him, bacteria, and leptospirae.

Use of the Salk vaccine has made nonparalytic poliomyelitis more difficult to identify, and physicians in Minnesota are increasingly reluctant to make this diagnosis, he stated. Diagnosis has also been complicated by the demonstration that many virus agents can duplicate clinically nonparalyzing aseptic meningitis. However, diagnosis has also been clarified by the laboratory's ability to assign precisely a single virus type as the etiological agent for an increasing number of clinically similar but etiologically different disease entities. These agents, the polioviruses and the Coxsackie and ECHO viruses, come from the family of enteroviruses.

In 1955 the agent responsible for most central nervous system viral disease in Minnesota was the polio-

virus; in 1956 Coxsackie B5 virus was isolated more frequently than any type of poliovirus; and in 1957 the predominant virus was ECHO 9, Kleinman said.

The table shows Minnesota's experience with viral disease of the central nervous system for these 3 years. Kleinman pointed out that the arthropod-borne encephalitides, lymphocytic choriomeningitis, and mumps meningo-encephalitis presented no major epidemiological problems. But the remaining categories in the table, poliomyelitis, Coxsackie B5 aseptic meningitis, ECHO 9 aseptic meningitis, and aseptic meningitis of undetermined cause, were a different matter.

#### 1955-57 Outbreaks

Although the total incidence was low, 1955 was definitely a poliomyelitis year. Poliomyelitis incidence was still lower in 1956 when

there was a definite outbreak of aseptic meningitis due to Coxsackie B5 virus. Of the 75 cases finally accepted as Coxsackie B5 virus infection in 1956, 32 were initially reported as nonparalytic poliomyelitis, Kleinman said.

Coxsackie B5 was first suspected on purely epidemiological grounds. In August 1956, a few counties in the south central part of the State reported nonparalytic poliomyelitis with no paralytic poliomyelitis in the same area, and laboratory reports showed the isolation of cytopathogenic agents, not poliovirus, from cases in this area. "It was thus an epidemiological probability and a laboratory certainty that something besides poliomyelitis was occurring," said Kleinman.

By the end of July 1957, the great disproportion between the nonparalytic and paralytic disease of the central nervous system and the presence of a rash in a certain percentage of the cases made it certain that the new disease entity was neither poliomyelitis nor Coxsackie B5 aseptic meningitis. ECHO 9 infection was suspected and later proved, Kleinman said.

A statistical survey based on a random sample indicated that some 200,000 persons in metropolitan Hennepin and Ramsey Counties were affected through the summer of 1957.

The survey suggested a secondary attack rate of 25 to 40 percent.

There is a reporting phenomenon behind the raw data presented in the table for the category aseptic meningitis, cause undetermined, he stated. In 1955, the 47 cases now listed were originally reported as 15 cases of suspected poliomyelitis, 30 cases of nonparalytic poliomyelitis, 1 case of western equine encephalitis, and 1 case of aseptic meningitis. Poliomyelitis and encephalitis were ruled out on serologic evidence.

In 1957, physicians, mindful of the 1956 experience with Coxsackie B5 virus, reported 658 cases under such designations as aseptic meningitis, suspected nonparalytic poliomyelitis, and viral meningo-encephalitis. The 1957 column of the table shows what happened to this total as laboratory evidence accumulated. The number of cases of aseptic meningitis, cause undetermined, will be whittled down further, Kleinman said, and he predicted most of them will be classified as ECHO 9 infections. Physicians are increasingly reluctant to make a diagnosis of nonparalytic poliomyelitis, he emphasized.

Although poliomyelitis was generally distributed throughout the State in 1955, it was possible to map out six areas where cases were concentrated. In 1956 with fewer cases, localization could still be

demonstrated in three spots, he said.

The Coxsackie B5 outbreak in 1956 occurred principally in two south central counties. Kleinman interpreted this as a northward extension of what was happening in Iowa. The geographic separation of poliovirus and Coxsackie B5 virus that year was sharp, he said.

There is good reason to believe that the 1957 outbreak of ECHO 9 aseptic meningitis in Minnesota was widespread, he declared. Poliomyelitis cases that year were few and were confined to the areas of greatest population density.

High attack rates in 1956 for nonparalytic poliomyelitis and Coxsackie B5 aseptic meningitis among the young (0-9 years of age) point to an adult population that is relatively immune because of childhood exposure. But attack rates for ECHO 9 aseptic meningitis in 1957 are similar enough for ages 5 to 40 years to suggest that adults in the State had had no childhood exposure and that this infection, therefore, was new to the State, according to Kleinman.

### Diagnostic Dilemma

"The diagnostic dilemma of the practicing physician can be profound and troublesome," he stated. The season of occurrence is no help because nonparalytic poliomyelitis, Coxsackie B5 aseptic meningitis, and ECHO 9 disease all occur at the same time of year. The age of an individual patient is no sure indicator of a particular viral cause.

The signs, symptoms, and cerebrospinal fluid findings cannot help to distinguish between Coxsackie B5 aseptic meningitis and nonparalytic poliomyelitis. ECHO 9 does have suggestive clinical characteristics such as the exanthem and severe headaches; in 42 percent of the Minnesota cases, the headache was described as exceptionally severe.

Perhaps the most important guidepost for the physician is the pattern of central nervous system disease occurring in a community. If there are a series of cases with none or a disproportionately small number showing lower motor neuron paralysis, then he may properly infer that

**Cases of viral disease of the central nervous system, Minnesota, 1955-57**

Diagnosis	1955	1956	1957 <sup>1</sup>
Paralytic poliomyelitis.....	207	67	30
Nonparalytic poliomyelitis.....	288	82	24
Mumps meningo-encephalitis.....	25	19	16
Coxsackie B5 aseptic meningitis.....		75	21
ECHO 9 aseptic meningitis.....			174
Western equine encephalitis.....		2	
St. Louis encephalitis.....		3	
Lymphocytic choriomeningitis.....	5	11	2
Aseptic meningitis, cause undetermined <sup>2</sup> .....	47	78	421
Total.....	572	337	688

<sup>1</sup> Data provisional.

<sup>2</sup> Includes encephalitis and meningo-encephalitis of unknown etiology.

NOTE: Table includes cases admitted to diagnostic categories on serologic, epidemiological, and clinical grounds. It does not include postinfectious encephalitis occurring after measles, rubella, and chickenpox. The laboratories of the Minnesota Department of Health and the department of bacteriology and immunology, University of Minnesota, collaborated on the virus isolations.



the disease is not poliomyelitis. This is the time to try to establish a definite etiology, said Kleinman.

The health department's poliomyelitis surveillance unit was impressed with physicians' staunchness in refusing to make a diagnosis of nonparalytic poliomyelitis. Unit members, impatient in 1955 with physicians who refused to make such a diagnosis at the height of the poliomyelitis season, now have only admiration for the physicians' restraint. The experience has been chastening, said Kleinman.

In 1956 and 1957 the epidemiologist was able to remove "cause undetermined" from two categories of aseptic meningitis and give the physician two new sets of references to use in his daily diagnostic routine. The epidemiologist can offer a composite picture of the signs and symptoms, intimate the relative frequency with which they occur, tell which age groups are most likely to be affected, and indicate the incubation period and the most likely mode of dissemination.

But change in the aseptic meningitides is so fast and continuous that the epidemiologist must be prepared to continue this type of work from season to season, said Kleinman. Fortunately, Minnesota had an operating poliomyelitis surveillance unit whose methods were immediately adaptable to study of the other aseptic meningitides. Without it, the studies of Cocksackie B5 and ECHO 9 aseptic meningitis would have been retrospective.

### Questions Raised

Kleinman listed questions raised by Minnesota's experience. Do these nonparalyzing diseases have some later effect? Dr. Albert Sabin has pointed out that serologic studies show that women of child-bearing age are particularly vulnerable to ECHO 9 infection if it is present in a community. Are pregnant women really more susceptible, as they seem to be, to poliomyelitis, and if infected, will there be any effect on the fetus? The similarity of the ECHO 9 rash and the rash of rubella makes this conjecture provocative.

What is the relative antiquity of

these infections? It is tempting to surmise, said Kleinman, that in past years when reports of nonparalytic poliomyelitis far outweighed reports of the paralytic disease, some of the nonparalytic cases might have been aseptic meningitis due to a then unknown cause. But divination is hazardous. Perhaps serologic epidemiology with all age groups well sampled would reveal the relative antiquity of these newly recognized viruses. This is worth trying, he suggested.

He commented on the administrative proposal that in the future, poliomyelitis be reported as such only when it is paralytic, and all nonparalytic conditions be reported under a term such as aseptic meningitis. Later the aseptic meningitis report could be qualified by designating the etiology, if it is determined. This plan would bring to the attention of health departments and epidemiologists cases which might remain unknown because present regulations do not require a report. This procedure also fits the present diagnostic temper of physicians, said Kleinman.

## Rise in Reported Syphilis Preventing Neurosyphilis

The increase in the number of cases of syphilis reported in 1957 may mean fewer cases of neurosyphilis, stated Dr. Harold A. Tucker, department of clinical investigation of the Upjohn Co., Kalamazoo, Mich.

United States data for 1957 shows a peak of 135,542 cases compared with a 1955 low of 122,075. The most recent total includes 100,514 cases of late and late latent syphilis, he said.

About 25 percent of syphilitics, if untreated, develop clinical evidence of involvement of the nervous system; 5 percent will be paretic, 5 percent tabetic, and 15 percent diffuse meningovascular. Neurosyphilis is potentially even more serious than cardiovascular syphilis as a cause of mortality and partial or complete permanent disability, Tucker maintained. Therefore the 1957 case to-

tal represents an estimated 25,000 potential neurosyphilitics found and treated.

Tucker listed two factors which will tend to prevent paresis and tabes dorsalis from developing: the grace period of 12-25 years between syphilis infection and the appearance of neurological symptoms, and the success of penicillin as a brief, effective treatment for syphilis. In two recent studies of 765 patients over a 6- to 7-year period, penicillin alone appeared capable of completely curing asymptomatic syphilis of the central nervous system.

Until promiscuous sexual activity or exposures to infected partners decrease in the Nation, we might be gratified to see annual reported totals increasing, Tucker said. This probably means that more cases are being found and treated, that contact tracing is being done well, and that serious late disease is prevented.

But no disease is ever treated out of existence, he declared. Only when promiscuity is reduced can we think that fewer reported cases reflect a reduced prevalence of central nervous system syphilis and other types of the disease.

## Health Department Solves Urbanization Problems

How public health fared as Sedgwick County, Kans., doubled its population and changed its economic characteristics in less than 20 years was described by Dr. M. Leon Bauman, director, Wichita-Sedgwick County Department of Health.

The county now has 320,000 people, whose needs for adequate housing, infant and child care, and sewerage and water systems reverberated in the health department.

Overcrowded, substandard homes and 90 trailer camps at one time housed the war industry workers who flocked into the county. Old residents resented newcomers who kept cows in the backyard and threw the garbage out for the chickens.

Housing improved, Bauman explained, as tenants became home

owners and more and better houses were built. In 1955 State legislation, drawn up by the local health department, authorized the Sedgwick County commissioners to regulate housing, sewage disposal, food-handling methods, trailer camp sanitation, water supply, and other environmental functions in certain areas of the county.

In 1957 the city of Wichita passed a housing code, designating the health department as the enforcing agency, but no funds have been budgeted for the program and it is being handled on a complaint basis. Recently the city appointed an urban renewal board, Bauman said.

### *Infant Death Rate*

As the county's population grew, the infant death rate rose alarmingly. Crowded housing, little understanding of sanitation and medical care among the newcomers, and overcrowded, understaffed hospital nurseries may have been reasons for this, Bauman said. The health department, the Kansas State Board of Health, and a community conference at the University of Wichita aroused public attention. Physicians, acting through the local medical society, appointed for each hospital a committee of a pediatrician and an obstetrician.

The health department supplied pertinent information on infant births, deaths, and stillbirths to each hospital's committee, and the State and local health agencies reminded hospitals of the need for improvements and better staffing in their child care facilities.

The resulting progress is indicated by the fact that 1956 and 1957 are the only 2 years in which the county's infant death rate was below that of the State as a whole.

Bauman listed two other health department projects that ensued. The agency now has charge of birth and death certificates for the county and supplies hospitals with birth, death, and stillbirth figures. Physicians now report certain premature infants to the health department so that public health nurses can visit and assist mothers to understand the special needs of these infants.

A large number of working

mothers and unsuitable housing created demands for child care, and after several incidents the State board of health drew up new regulations for licensing child care homes. The local health authority is responsible for explaining the standards and regulations and evaluating the homes' maintenance of them. Although Sedgwick County has more than 100 homes licensed to care for children, the department was able to carry out this task without enlarging its staff, Bauman said.

### *Sewage Disposal*

Wichita and other communities in the county could not extend sewage lines as rapidly as they were needed. Because people outside the city limits were reluctant to pay for extending the sewers, a number of housing developments built their own sewage disposal systems. Wichita is now ringed with systems which will be difficult to incorporate later into a unified disposal system, he stated.

The city's sewage disposal plant, operating almost at capacity before the population boom began, soon fell behind in its operations. Much sewage bypassed the plant to flow directly into the Arkansas River. During World War II little could be done about enlarging the plant, and afterwards other projects were deemed more important, Bauman said. However, with 5 years of drought, the river receded until the only water it carried was effluent below the outfall of the Wichita sewage system.

Air pollution developed as oil refinery wastes containing considerable sulfur and acid wastes from an aircraft plant were added to the city's untreated, unoxidized sewage. In certain atmospheric conditions, a misty fog of hydrogen sulfide hung over a large area downriver. After the refinery stored its wastes, the aircraft factory turned its wastes alkaline, and the city chlorinated its wastes, there was no more hydrogen sulfide, Bauman reported.

But the State board of health called Wichita a serious polluter of the river, and after a bond issue to build additional treatment facilities was defeated, the State board refused to let any more sewer lines be

built in the city until ample treatment facilities were assured. The bond issue was resubmitted and carried, and additional facilities are being built.

Wichita had disposed of its garbage by hog feeding and private and municipal collection. Often, however, the spreading suburbs and fringe areas without effective disposal methods harbored and fed rodents and flies. In 1948 Wichita had six cases of typhus fever. The health department added to its functions rodent control throughout the county.

The department also persuaded builders to install garbage grinders in most new houses. This step and residual spraying helped to control flies. Bauman feared that the problem may return because Wichita recently stopped municipal garbage collection and returned to a contract system.

### *Water Supply*

In 1950 few towns in the county had municipal water supplies and only Wichita chlorinated its water. After intensive work by health department sanitarians, nearly all communities now have supply systems and all chlorinate their water.

Underground water can be obtained in this part of Kansas by sinking a sandpoint 30 feet, and some 15,000 people in Wichita alone have private wells. Many are carelessly constructed, and a great number are cross-connected to the city water supply. Correcting this has been difficult because of popular protest to a city commission proposal a few years ago to license private wells. The license fee was designed to pay for evaluation and control programs and also yield additional revenue.

Wichita draws its water supply from Equus beds covering a large area 20 to 30 miles away. In dry weather, large pumps in this pool create a drawdown. Public objections to this have engaged the city in continuing court litigation. The city is now negotiating for the construction of a dam on one of the nearby rivers, which would increase its water supply.

When public health hazards de-

veloped in food-handling practices, the city passed codes enabling the health department to act more effectively. The department developed a continuing food-handlers' training course which has helped to improve food sanitation, although much still is to be done, according to Bauman. In other parts of the county, food-handling practices are controlled under the rules and regulations of the State board of health.

The health department has changed along with the county, he said. After several years of preliminary work, a joint city-county health department began operating in 1950. Since then the department has taken on 11 new programs with few additions to its staff. Fewer nurses were budgeted for and less is being paid for nursing time in 1958 than in 1951, although nursing service was increased two and a half times. Sanitation visits have increased substantially, and laboratory services went up 125 percent with no increase in staff. The department moved into a new \$750,000 health center in 1957.

Some problems are solved, said Bauman, but others, such as further coordinating the various areas of the county, are still ahead. Financial support from sources other than the governments of the county and city is increasingly necessary. This may lead to a true, countywide joint board of health, instead of the present arrangement, which makes the department's director responsible to the city manager of Wichita and to the chairman of the board of county commissioners, he predicted.

## Business Methods Urged For Health Services

A more effective combination of "businesslike methods and missionary spirit" in public health was urged by Dr. Albert E. Heustis, Michigan's State health commissioner, who told health workers to "do some real soul-searching before starting out to taxpayers with new baskets of provisions labeled essential to public health protection." The public, like stockholders in a

business, expects "utmost efficiency" in government health operations, he emphasized.

Health agencies should consider seriously using persons with less training to help doctors and nurses extend available services, and should look into the possibilities of "pay-as-you-grow" health services, he said.

Michigan's summer program of painting fluoride on the teeth of children was cited as an example of a self-supporting service. Carried out by senior dental students and dental hygienists under the supervision of health departments and practicing dentists, the effort is financed by nominal fees paid by parents.

"Mutual understanding between health workers and the people can reverse some of the worst and most deplorable failures in public health today," Heustis declared.

"There should be a way to persuade people to use poliomyelitis vaccine in November, rather than mobbing doctors in June. There should be a way to warn families with dreams of a home in the suburbs that unless they use care they may end up sloshing around in their own sewage up on septic tank hill. And there should be a way to impress women with the fact that a simple examination may save them from cervical cancer. We have to work harder to develop the understanding, advice, and support of the consumer," he said.

In view of changing trends and technology, health agencies should evaluate services more frequently to make sure they are keeping on course. He contended that government services in health should be planned on the basis of function rather than along more limited lines.

"The confused patterns of political boundary lines often forestall doing a workmanlike job; these ink curtains on a map keep us from delivering businesslike health protection services . . . the time is ripe right now to give up Granny's patchwork quilt."

Community health services, he asserted, can be as dynamic as the rocket age population we serve.

## Community Health Work And Changing Times

The meetings of this and of the many other public health associations in the United States could well serve as the study forums for new departures in health work, suggested Dr. John D. Porterfield, Deputy Surgeon General of the Public Health Service.

"The planning and development for these departures might well spring from the many local communities which, over the years, have made America strong. Their separate tests of widely varying ideas, applied in a number of different ways, could be presented for discussion at these annual forums, and these discussions could serve as the forcing bed for new experiments along the lines of the most successful ventures being carried out. The accolade of widespread adoption given to programs initially tried in one or a few communities and the reverberations of successful health progress on the public and the Nation might well inaugurate a new and splendid chapter in the public health movement we so gladly serve."

As Porterfield noted, "The acute communicable diseases that once taxed the fullest powers of former generations of our colleagues have diminished in lethal force and are giving way to the chronic diseases, the devastations of the damaged heart and arteries, radiological hazards, air pollution, accidents, alcoholism, mental disease, and all the other problems peculiar to our age of anxiety, tension, hope, and aspiration. As a population, we grow older and increasingly are becoming victims of the many disabilities of debilitation.

"In the last half century we have passed from pioneering individualism to a mass interdependency," said Porterfield. "No man any longer goes alone. We are interconnected, interdependent, international, interracial, intercultural—in a word, we are one. Society has become an intricate organism—a social design so complex that the slightest distortion might bring on its ruin.



"The problems that confront us today are not one-agency problems. Aging, for instance, presents challenges that cut across many departmental lines—public health, social welfare, mental hygiene, hospitals and nursing homes, rehabilitation, and others. Similarly, the chronic diseases, though principally the responsibility of health departments, are also interdepartmental, inter-agency, interfacility responsibilities. To achieve our ends in these fields will require a harmonious coordination of planning and effort, of institutions and agencies, of citizen

groups and professional organizations, of concepts and methods."

However, Porterfield pointed out, the present era holds high promise. "In our complexity there is strength, and in our enforced oneness there is a will that could triumph. We are at least dreaming of a future in which men may be truly free of despair and disease, of hopelessness and fear. We shall have to make that future soon, if at all. We have the earliest threads of that grand design in our fingers. To weave them properly will require the great-

est exertion of our imaginations, our insight, instinct, and educated skill."

Porterfield believes that these new public health programs can be created and that the challenges of the changing times will not daunt or threaten us. We will find ways through the social wilderness to successes greater than any we now think possible, he said. He feels sure that all health workers share with him "the dynamic belief that man as a social being can achieve, within the limits of his physical universe, his own desirable destiny in health and well-being."



### Sanitation

Authority to act against future danger to health—*Board of Health of the State of Maryland et al. v. Edward J. Crew*, 129 A. 2d 115 (1957).

A State statute conferred upon the Maryland State Board of Health authority to order the abandonment or to prevent the construction of a private well which is or which may become prejudicial to health, whenever a system of water supply serving the public is directly available. Appellee, dissatisfied with the available public water supply, dug a well within 60 feet of his septic tank in violation of regulations prohibiting wells within 100 feet of a source of pollution. Ordered to abandon his well by the board of health, he sued for an injunction restraining enforcement of the order, alleging that the order was unlawful, unreasonable, and deprived him of property without due process of law. The lower court in issuing a perpetual injunction held that the board not only failed to show that the well was prejudicial to health but failed to show a reasonable possibility that it might become so.

In reversing the lower court, the court of appeals held that the statute itself, which required compliance with standards designed

to protect the public health, is a proper and constitutional legislative exercise of the police power. Second, it held that at the time of the board's order, although there had previously been an interruption in service, the evidence revealed that an adequate and safe public water supply was available to appellee, a condition required by the statute before the board could issue the order. Finally, the evidence showed that although the water in the well was pure at the time of the order, contamination might and probably would occur at some later date. The court said that "protection of the public health is not required to wait until contamination is shown to exist" and held that the legislature contemplated that the board could act where its observation of conditions, in the light of scientific knowledge of probabilities that might occur in the environment, led it to believe that health might be affected. Accordingly, the order requiring abandonment of the well was declared to be neither unreasonable nor unnecessary and was upheld.

# Opiates and Opiate Antagonists

**A**DVANCES in knowledge of the clinical uses of the recently discovered opiate antagonists nalorphine and levallorphan in the treatment of opiate and opioid poisoning, and the use of these drugs in the diagnosis of narcotic addiction, are reviewed in this monograph. Also discussed is the abuse of narcotic drugs, including the neurophysiological and psychological mechanisms of intoxication, pharmacogenic dependence, and relapse after cure.

## Clinical Uses of Opiate Antagonists

In human subjects, nalorphine produces autonomic effects resembling those of morphine, but often it also produces hallucinatory and other mental disturbances, particularly after repeated doses or large single doses. In man, nalorphine has analgesic properties, and repeated doses do not produce addiction (physical dependence), but its "side effects" impair its clinical usefulness in the management of pain. In medical practice, nalorphine has been used primarily for resuscitation of patients poisoned by overdoses of morphine, heroin, methadone, dihydromorphinone, pantopon, levorphan, meperidine, or alphaprodine. In such cases, the most prominent narcotic antagonistic effects are those exerted on respiratory depression. In subjects addicted to morphine, methadone, heroin, and many other opiates and opioids (except possibly meperidine), nalorphine precipitates acute "abstinence syndromes" and has therefore been used clinically in the diagnosis of active addictions. Analysis of dose-effect relationships both in man and in animals suggests that nalorphine and its analogs exert their "specific" narcotic-antagonistic actions by (a) "molecular competition" and (b) "unmasking" of the processes responsible for the opiate and opioid abstinence syndromes.

## Narcotic Drug Abuse

The problems of narcotic drug abuse include "euphoria," "addiction," and "habituation,"

and these are considered both from the neurophysiological and psychological viewpoints.

The distinction between "positive" and "negative" euphoria is discussed, and the latter is considered mainly from the standpoint of mechanisms involved in the production of morphine analgesia.

Neurophysiological data obtained chiefly in studies on "analgesic-test" reflexes in animals indicate that morphine exerts selective depressant actions on interneuronal activity in the spinal cord, medulla, midbrain reticular forma-



## Public Health MONOGRAPH

### No. 52

The accompanying summary covers the principal findings presented in Public Health Monograph No. 52, published concurrently with this issue of Public Health Reports. The author is with the National Institute of Mental Health Addiction Research Center, National Institutes of Health, Public Health Service, Lexington, Ky.

Readers wishing the report in full may purchase copies of the monograph from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. A limited number of free copies are available to official agencies and others directly concerned on specific request to the Public Health Service. Copies will be found also in the libraries of professional schools and of the major universities and in selected public libraries.

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Wikler, Abraham: Opiates and opiate antagonists. A review of their mechanisms of action in relation to clinical problems. Public Health Monograph No. 52 (PHS Pub. No. 589). 39 pages. U. S. Government Printing Office, Washington, D. C., 1958. Price 30 cents.

tion, lateral posteroventral, and certain of the medial thalamic nuclei and cerebral cortex, while also exerting excitant actions at all levels and augmenting supraspinal inhibition.

Evidence acquired in studies on both man and animals indicates that one of the important psychological actions of morphine is reduction of pain-anticipatory anxiety. Other actions of morphine that may be involved in the production of euphoria are discussed with particular reference to personality factors.

The neurophysiological effects on the morphine abstinence syndrome of bilateral frontal lobotomy and physiological "transection" of the spinal cord in man (due to disease), and of decortication and spinal transection in the dog, indicate that the processes responsible for addiction operate at cellular (neuronal) levels throughout the neuraxis and appear to involve "counter-adaptations" to the depressant effects of morphine on interneuronal activity. While data obtained in frontal lobotomized patients and in monkeys subjected to bilateral frontal lobectomy, bilateral cingulumotomy, or bilateral ablation of the cingulate gyri are conflicting in some respects, it appears that although the integrity of the cerebral cortex and its connections with subcortical structures is necessary for the expression of "purposive" abstinence phenomena, the "nonpurposive" features of the morphine abstinence syndrome are integrated to a very large extent subcortically. In addition, studies on man indicate that during morphine addiction, adrenal and gonadal activities are depressed, probably through an indirect effect on the pituitary gland, and that transient "rebound" adrenal hyperactivity occurs on withdrawal of the drug.

In considering the psychological aspects of addiction, it is stressed that with the development of tolerance the "euphoric" effects of morphine become progressively attenuated, but that new sources of gratification are developed as a consequence of the progressively intensified "need" for the drug. The "rewarding" effects of morphine include the periodic relief of "craving," the sense of achievement engendered by successful pursuit of drug supplies ("hustling"), and social acceptance of the user by other addicts. Also, the suffering attendant upon abrupt and complete withdrawal of the

drug may serve some addicts as a means of expiating guilt.

The role of "conditioning" in the genesis of relapse (habituation) is discussed from both "classical" and "instrumental" theoretical viewpoints. A number of suggestive, but not conclusive, observations indicate that the opiate abstinence syndrome may become "conditioned" to regularly associated environmental stimuli. If verified, such a process could account, in part, for the motivation to relapse under certain circumstances long after the "unconditioned" morphine abstinence syndrome has subsided. Data more strongly supported by experimental evidence, obtained in rats, indicate that the recurrent reduction of abstinence distress during maintained morphine addiction can result in reinforcement of such of the organism's activities as culminated regularly in administration of the drug, and that in consequence, "drug-seeking" behavior may persist beyond the duration of the "unconditioned" abstinence syndrome.

It appears likely, therefore, that the probability of relapse is not only a function of the initial "euphoric" effects of opiates, which diminish rapidly as tolerance develops, but also of the cyclic actions of these agents in generating dependence and in relieving abstinence symptoms. These actions persist as long as the opiates are administered at sufficiently high dose levels and at sufficiently frequent intervals. The probability of relapse is also related to the extent to which the administration of these drugs is brought about by actions of the organism upon its environment. In addition, theoretical considerations suggest that "secondary reinforcers," or stimuli regularly associated with reduction of abstinence distress during maintained addiction, may serve as incentives for subsequent relapse.

Although practically nothing is known about the neurophysiological mechanisms operating in relapse, progress in that direction, as well as in the further elucidation of the psychological processes involved, may become possible with continued improvement of recently developed techniques for demonstrating in animals a "model" of this most important of all problems of drug abuse.



# Operational Planning in Civil Defense for Environmental Health

KENNETH C. LAUSTER, M.S.P.H.E.

**T**ECHNICAL preparations for the eventualities of a disaster are of little value without an operational plan describing the course of action to be taken in a given contingency. The operational plan says in specific terms who does what, when, and how. It is the mainspring of civil defense work.

There have been many activities in civil defense planning over the past two decades. One, the mutual aid program for waterworks, begun during World War II, is still carried on in many areas and serves a useful purpose. Following the 1955 floods in Pennsylvania, this program was the principal means for the emergency restoration of many damaged or destroyed waterworks.

Volumes have been written about the technical aspects of civil defense and natural disaster problems. These have been issued by the Federal Civil Defense Administration (since July 1, 1958, combined with the Office of Defense Mobilization to form the Office of Civil and Defense Mobilization), the Public Health Service, State and local departments of health, the Armed Forces, professional and technical associations and societies, the American National Red Cross, and the National Research Council Committee on Disaster Studies. The suggested reading list for civil defense health services includes only a small part of the avail-

able literature, yet the titles cover four typewritten single-spaced pages. There is no dearth of technical information for those desiring it.

A considerable amount of training has been undertaken by the Federal Civil Defense Administration through its Staff College and Radiological Defense School, by the Department of Agriculture, by the Department of Defense, by the Public Health Service, and by the Food and Drug Administration, although some of the PHS courses and the FDA courses were suspended on July 1, 1957. The radiological health training course, conducted for years by the Public Health Service at the Robert A. Taft Sanitary Engineering Center in Cincinnati, is continuing.

The result is a considerable reservoir throughout official health organizations of technically informed professional personnel whose services would be invaluable in disasters. However, plans to use their competencies effectively were inadequate or nonexistent. The big void was in the development of operational plans tailored to current planning assumptions which are based on enemy capabilities. These assumptions are set forth in detail in FCDA Advisory Bulletin No. 204.

The major threat is attack by thermonuclear weapons in the megaton range. There is no defense against this weapon except distance and shielding. If we had shielding or blast shelter, our plans would utilize them. But in their absence, the only protection is not to be near the weapon when it detonates. Hence, the Federal Civil Defense Administration recommended the broad policy of evacuation as the best means of saving a substantial portion

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of the people. Application of this policy must depend upon local circumstances. The determination of whether to evacuate or not is the responsibility of the States and communities.

The threat of biological and chemical warfare agents is not being overlooked. A growing school of thought holds that, as the thermodynamic capabilities of the prime adversaries reach a stalemate, biological and chemical warfare agents are likely to take on increasing importance.

### **The Gap in Civil Defense**

In observing the civil defense preparations being made throughout the country, it was noted that the most important phase, operational planning, was being neglected, largely because of the States' inability to finance the development of operational plans. All technical preparation is of little or no value without an operational plan which assigns functions and areas of responsibilities to the people in governmental positions. They must know the who, what, where, when, and how of their community's civil defense plans. They must know who is the boss, who takes the boss' place when he isn't there, and who replaces the substitute boss when he is not there. They must know what equipment and supplies are available and where they are to be found. They must know how to obtain transportation and how and with whom to communicate.

As the history of disasters reveals, chaos is almost inevitable when there is no operational plan to control and direct the forces attempting to give aid. The account in FCDA Technical Report 11-2 of the Arundel Park fire in Baltimore contains a typical incident. A physician residing in the neighborhood took his bag and went to the fire to help. He reported seeing confusion and elements of panic. He gave first aid, administered drugs he had with him, marked each patient with the medication and the time it was given, directed ambulances not to converge on the nearest hospital, and advised about 100 of the injured to see their own doctors. He soon ran out of supplies.

The only other sources he knew of were the first aid kits of fire wagons and ambulances. Too late he discovered that supplies were avail-

able from local druggists, and that a health center and casualty clearing station where stretchers, dressings, and antibiotics were stored was only a few blocks away.

A county health officer received no notification of the fire until he heard of it on the radio at his home in Annapolis. He rushed to the site but arrived after all casualties had been evacuated. Although he was chief of the organization planned to handle disasters, he was powerless to make the organization effective because physicians were not aware of the disaster plan.

Realizing the importance of operational plans and their lack in most areas, the FCDA launched a survival planning program some 2 years ago. This program is entirely financed by Federal funds through contracts with the States. The States hire the personnel and do the work under the terms of the contract. Some 47 States and Territories are now engaged in this activity.

### **The Plan's Function**

The operational plan is the joint product of the area's chief executive, such as the governor or the mayor, and his staff. However, once the chief executive has approved and adopted the plan, it becomes his personal standing order and he takes complete responsibility for it. Prior to putting it into operation, the plan is subject to continual review, revision, refinement, and amendment, and all improvements in organization, training, and equipment are a part of the plan.

Destruction of communications and facilities by enemy attack will make it impossible for the chief executive to influence the actions of emergency forces for periods ranging from a few minutes to several hours or days. Therefore, control during this period may be decentralized, down to single service units of a few persons. Not until communications have been restored can the chief executive again influence action.

At this point of decentralization the operational plan is vitally necessary. As the standing order of the chief executive, it substitutes for his personal instructions until his control has been reestablished. Under these circum-

stances the success or failure of the operational plan becomes the success or failure of civil defense as a whole.

As control is reestablished, the flow of information and intelligence resumes, enabling the chief executive to operate in accordance with the situation. His future actions and orders are customarily expressed with reference to the operational plan, and often as modifications of it.

The entire process of meeting massive damage throughout an area depends on the soundness of the operational plan. The people's will and ability to resist, to save lives and property, to restore a community to a state approaching normal living, and ultimately to safeguard the productive capacity of the Nation, all are rooted in the practicability of the operational plan and the proficiency of its working organization.

Most of the work already done in the States under the survival planning program has been confined to the development of an organization and an operational plan at the State level and State-district level. This is essential to provide a frame of reference for lower echelons as they prepare their own plans. Without it, two or more cities may expect to use the same facilities in their civil defense plans.

To date these plans are generally sketchy, and to make them truly operational will require considerable study and revision by the people charged with the responsibility for carrying them out. It is imperative that the people assigned places in the organization be fully aware of their positions and their duties and responsibilities. They must also know to whom they are responsible, where they report, what they have to work with, and other details. These same people must be consulted in the planning so that the ultimate blueprint for action is tailored to their capabilities.

The general method of approach in most States is to assign to a staff member or members the responsibility of developing the operational plan. This is an appropriate procedure, and experience has demonstrated that an initial draft of the plan will be ready in the shortest possible time. However, unless the staff then studies the plan thoroughly, making appropriate revisions and additions, and becomes thoroughly familiar with it, the plan is worthless.

Health departments throughout the country too often are not aware of this planning and take little or no interest in it. They seem to feel that their civil defense readiness is complete if someone is assigned to prepare a plan.

Actually, at this point the essence of planning begins. For at this stage the people who are responsible at the grassroots begin to act.

Furthermore, in the event of an enemy attack, health authorities can never hope to provide much more than the nerve center of the total organization needed. But around this center the various kinds of auxiliary personnel must be assembled to accomplish the tasks of restoration.

### **Sanitation and Civil Defense**

In all of the plans of the various States engaged in civil defense planning that I have seen, sanitary engineering and sanitation are always considered. In many instances, it is the only public health program mentioned. Why, I do not know. I like to think it is because the public recognizes sanitation as the foundation of public health work. Perhaps a lack of professional guidance has resulted in the omission of some important public health programs. Or possibly, after a study of the situation the realistic conclusion drawn, based on the limits of capabilities, is that all efforts must be concentrated on sanitation to provide maximum return for effort expended.

What are the specific responsibilities of the sanitary engineer and the sanitarian? Certainly they encompass all of the customary ones, complicated by the possible use of chemical warfare contaminants, biological warfare contaminants, and radioactivity. At the minimum, the sanitary engineer must be prepared to protect water, milk, and food supplies from all normal contaminants and those introduced overtly or covertly by the enemy.

The technical aspects of this task should not be completely overwhelming. It is clear that sanitarians and sanitary engineers must equip themselves to handle the problems associated with radioactivity in this age when the atomic energy industry is rapidly mushrooming. This capability must be developed as one more public health concern.



The same attitude can be applied to chemical warfare agents. The nerve gases are second cousins to the newer insecticides being used so widely in insect control and agriculture. Sanitarians must know how they are being utilized. We have been familiar with the biological warfare agents for years. However, the disease manifestations from various modes of dissemination may become extremely perplexing and cause much damage before they are ultimately brought under control.

How can we assume these added responsibilities when our overburdened staffs cannot discharge all the duties now placed upon them? This dilemma has always been with us. The only answer is that we must find ways of accepting these responsibilities because if we do not, someone else will assume them. And that would fractionate still further the health activities which are already too fractionated. If we provide the leadership and the coordination for those who do express an interest in these matters, we can retain in official health agencies those activities which rightly belong to them.

In attempting to envision the conditions of modern war, it is important that we think of a program based on facilities prevailing a half century ago. Initially, fallout may prevent movement in many areas. Communications will be disrupted and electric power unavailable, with a consequent lack of heat, light, refrigeration, sewage disposal, and water supply.

We must prepare to exist on our local resources, possibly for weeks. OCDM recommends that each family prepare to remain within its own home for no less than 14 days. Any immediate aid following an attack must be local in origin. No State should plan for or expect to receive any assistance from outside sources or from the Federal Government for at least 30 days following an attack. However, Federal aid will be forthcoming as soon as it is humanly possible in the circumstances.

In making operational plans for emergency action today, we must never forget the possibility that this threat will be with us for a long time. In designing, constructing, and re-

constructing sanitary facilities, we should think of reducing their vulnerability to blast effects, and of their functioning during power interruptions. Although we recognize our dependence on central sources of water and power and on central systems of sewage collection and disposal, we must consider the advisability of building into these systems the maximum degree of self-sufficiency at the lowest possible level of operations.

### **Achieving Readiness**

Four principal survival measures are necessary to achieve a state of readiness. They are:

- The establishment of emergency lines of succession for key personnel in the organization.
- The preservation of records essential to continued functioning and emergency actions.
- The establishment of emergency locations for operations.
- The full utilization of all personnel, facilities, equipment, and supplies for emergency operations.

The first three measures are relatively simple to accomplish, but they are absolutely essential and must be part of any planning. The fourth is far more difficult.

How many civil defense organizations know what personnel, facilities, equipment, and supplies are available for emergency sanitation operations? How many have made a study of what would be needed to accomplish such a task in the kind of disaster we may encounter? After such studies, what balance was struck between what is available and what might be needed? What are the deficiencies and what action is being taken to overcome them?

These are some of the environmental health aspects of civil defense. Basic to them, and to all other civil defense activities, is operational planning. This planning must be done by those who will be responsible for putting it into action. The plan is merely a record of what has been undertaken and completed by official health agencies. The plan itself is nothing, but planning is everything.

# Efficacy of Chloramphenicol Therapy for Typhoid Carriers

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THE VALUE of chloramphenicol in the treatment of typhoid fever has now been well established, but a question remains as to what effect, if any, therapy with chloramphenicol has on the prevention of the chronic typhoid carrier state.

Even before the use of the antibiotics, many attempts were made to find an agent that might be effective in eradicating the focus of typhoid bacilli in the chronic carrier. Search through the literature, to be described shortly, reveals many experiments with many different drugs and combinations of drugs, but these have been unsuccessful, or, if successful, have lacked confirmation. Some investigators reported cures, but in most instances they had reference to temporary or convalescent carriers and not to chronic typhoid carriers. This paper deals only with the chronic typhoid carrier state. Carriers are defined as persons who have not suffered from typhoid fever within the previous 12 months but discharge typhoid bacilli. They may or may not have had a clinically recognized attack of typhoid fever, but they excrete the organism over a period of at least 1 year. Chronic carriers who shed typhoid

bacilli at irregular intervals are sometimes called intermittent carriers.

In the absence of a reliable method of terminating the carrier state, particular interest centers in the possibility of preventing its development by the modern methods of treating the acute infection. The study here reported was designed in the summer of 1952 to evaluate the results obtained when cases of typhoid fever were treated with chloramphenicol. Data collected on 1,413 cases from Mississippi and Louisiana suggest that chloramphenicol has no marked effect on the prevention of the typhoid carrier state.

With the rapid reduction in the number of cases of typhoid fever, however, there is a corresponding reduction in the number of carriers. Feemster and co-workers attempted to collect figures on the number of typhoid carriers in the United States, but there was so much variation in the information available from State health departments that the tabulation was not satisfactory (1). However, figures are available for Massachusetts, with an estimated prevalence of approximately 25 per 100,000 population (2); for New York, 42 per 100,000 population (3); and for Mississippi, 228 per 100,000 population (4). Typhoid carriers still constitute a sizable and important problem.

The medical, socioeconomic, and psychological importance of the typhoid carrier problem has led many clinicians to seek medical treatments rather than cholecystectomy for the cure of typhoid carriers. Stertenbrink in 1928 reviewed the earlier German literature on this

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subject, analyzing the results achieved with the use of more than a hundred different therapeutic agents (5). He concluded that none of the methods was successful or even held promise. With the advent of the sulfonamide derivatives, new tests were devised but these likewise proved disappointing (6,7). After Bigger demonstrated the in vitro synergistic action of penicillin and sulfathiazole on *Salmonella typhi*, these drugs were used by several groups of workers in the treatment of chronic typhoid carriers (8). Korn and Trussell reported no cures (9). Smith and others state that sulfonamides and penicillin are ineffective in therapeutically attainable levels but that the newer antibiotic, chloramphenicol, seems more promising (10). However, numerous reports, among them Stryker (11) and Nichols (12) suggest that treatment of chronic carriers with chloramphenicol results merely in temporary cessation of the shedding of bacilli. A more recent possible exception to the usual experiences is reported by Carnes and associates who state that 6 of 7 carriers were cleared up by preparing them for drug therapy with chloramphenicol by an intensive course of typhoid immunization (13).

#### Materials and Methods

The study reported here was carried out over a period of 3 years, and the data were collected on cases occurring from 1947 through 1952 in Mississippi and Louisiana. The two States are comparable in many respects: As of the 1950 census, the population of Mississippi was 2,178,914 and of Louisiana, 2,683,516; both States have large rural areas; both are in the South Central region and have approximately the same incidence of typhoid fever; and the counties and parishes are well supplied with local health units. The use of chloramphenicol did not become widespread until late 1949. Therefore, while most of the typhoid fever cases in the control group occurred from 1947 to 1949, most of the treated ones occurred from 1950 to 1952.

The study population was divided into four groups according to the treatment received: those receiving no chloramphenicol and referred to as nonspecifically treated; those re-

ceiving inadequate total dosage of chloramphenicol; those receiving adequate total dosage initiated before the 15th day from onset of illness; and those receiving adequate total dosage initiated after the 15th day from onset of illness. Only those patients receiving chloramphenicol in dosages of 30 gm. and over were considered adequately treated. In 1950, the drug manufacturer revised the dosage of chloramphenicol (Chloromycetin) to an average of 30 gm. per patient to be given over a period of approximately 14 days. This was the dosage considered "adequate" in this study. Children received proportionate amounts of the drug equivalent to the adult dose on the basis of body weight.

Data were obtained from morbidity reports, hospital records, mortality reports, laboratory reports, epidemiological records in the local health departments, private physicians, pharmacists and reports of field investigations of cases. I investigated all reported cases of typhoid fever in Mississippi during 1950 to 1952 and part of 1949.

All identifying data on typhoid fever cases reported to the two State health departments during the study years 1947 through 1952 were recorded on a master list by year of report and by county or parish. These data included the hospital number and the name of the reporting physician. A list of the cases was then sent to the local health department with a request for the epidemiological record on all cases that had occurred in the county or parish during the study years. After copies were made the original records were returned to the local health departments. As the records were completed they were filed alphabetically, and were then taken to the hospitals where data from the hospital record were transferred to the study record. New records were made on those cases diagnosed by the hospitals as typhoid fever but not reported to the States. I then visited the State laboratories and obtained lists of all cultures reported positive for *S. typhi* during the study years. This information was added to the epidemiological records if it had not already been recorded.

Where information was incomplete, visits were made to the counties and parishes to obtain missing data. In many instances this



necessitated visits to private physicians and to homes of the patients. Pertinent information was transferred to cards for tabulation. Each record was carefully analyzed and evaluated. Reported cases that were considered not to be typhoid fever were omitted from the study. The cases rejected because of insufficient evidence to diagnose them typhoid included probable instances of such diseases as brucellosis, paratyphoid fever, cancer, tuberculosis, amebiasis, pneumonia, murine typhus, histoplasmosis, and tularemia. These were proved later by bacteriological and other diagnostic examinations to be these diseases. Other cases which were undoubtedly typhoid fever were excluded because of inadequate data as to treatment or because of inadequate followup in instances of moving, inability to locate, loss of hospital records, and death. Fifty-three cases in all were rejected.

#### Diagnostic Criteria

The remaining 1,413 cases presented the usual clinical features of typhoid fever. Furthermore, the diagnosis was proved in more

than half of the cases by recovering *S. typhi* from the blood, feces, urine, pus, or spinal fluid. In most of the remaining cases, the diagnosis was based on serologic grounds, plus clinical symptoms and epidemiological evidence, or, in a relatively few cases, on epidemiological association with bacteriologically proved cases. The cases diagnosed on serologic evidence either demonstrated agglutinins in the blood which reached levels of diagnostic significance with anti-O titers of 1:640 and anti-H titers of 1:1280, or higher, or manifested at least a fourfold rise in agglutinin titer. Many of the cases diagnosed on serologic and epidemiological evidence were part of large outbreaks.

All reported typhoid cases were investigated by the local health departments. Specimens of blood, feces, and urine were collected as part of the routine epidemiological investigation of typhoid and suspected typhoid cases and the families of the patients. The Mississippi and Louisiana departments of health require that the cultures of at least two feces specimens and two urine specimens be negative for *S. typhi* on all reported typhoid fever cases before

**Table 1. Cases of typhoid fever in Louisiana and Mississippi, 1947-52, by age, race, and sex, with rates per 100,000 population per annum for age and race**

State and age (years)	Number of investigated cases <sup>1</sup>									Rate <sup>2</sup>		
	White			Nonwhite			Total					
	Male	Fe- male	Total	Male	Fe- male	Total	Male	Fe- male	Total	White	Non- white	Both races
<i>Louisiana</i>												
0-4-----	27	29	56	37	29	66	64	58	122	4.4	8.8	6.1
5-9-----	40	35	75	41	39	80	81	74	155	7.2	13.1	9.4
10-19-----	71	54	125	60	59	119	131	113	244	7.4	12.0	9.1
20-39-----	102	73	175	46	40	86	148	113	261	5.1	5.9	5.4
40 and over-----	50	31	81	25	22	47	75	53	128	2.4	3.1	2.6
All ages-----	290	222	512	209	189	398	499	411	910	4.7	7.5	5.7
<i>Mississippi</i>												
0-4-----	12	16	28	24	20	44	36	36	72	3.5	4.9	4.2
5-9-----	29	13	42	35	36	71	64	49	113	6.0	9.6	7.9
10-19-----	36	27	63	46	36	82	82	63	145	5.0	6.7	5.9
20-39-----	26	28	54	29	21	50	55	49	104	2.6	3.3	2.9
40 and over-----	34	16	50	12	7	19	46	23	69	2.2	1.2	1.8
All ages-----	137	100	237	146	120	266	283	220	503	3.3	4.5	3.8

<sup>1</sup> From State department of health and unreported hospital cases.

<sup>2</sup> Based on population data from 1950 census.

patients are released from isolation and public health supervision. Sheppard-Keidel vacuum bleeding tubes were used to take blood for culture and serology, and standard 10-dram, screwcapped glass bottles containing a preservative were provided for feces and urine specimens. With few exceptions all culture work was done by either the laboratories of the State health departments or in Louisiana by the Charity Hospitals. Materials and methods used for culture and serology in the major laboratories were of approved types and were not changed importantly during the 6 years of the study.

### Additional Followup

As part of the followup, a series of feces and urine specimens were obtained during 1953 on all patients whose cultures had been found positive for *S. typhi* intermittently for 2 months or longer during or after convalescence. This followup also included those cases which had not been reported to the State health departments by the hospitals and any cases which in the opinion of the writer, had not been ade-

quately investigated. All told, approximately 780 cases were re-investigated in this manner. As a result of this followup four persons who previously had been discharged following chemotherapy and two negative feces and urine cultures were confirmed as chronic typhoid carriers. By investigating some of the sources of these reopened cases, other chronic carriers were found and were placed under public health supervision. A considerable amount of the "shoe-leather" epidemiology was done by the public health nurses. I also visited and obtained specimens on numerous cases in the study.

### Results

Table 1 shows the distribution of all study cases of typhoid fever in Louisiana and Mississippi by age, race, and sex. The table also presents the rates per 100,000 population for the 6-year period 1947 to 1952. In both States the highest rates were found in the groups aged 5-9 and 10-19 years, with those 40 and over showing the lowest rates. The rates were higher among the nonwhites in all age groups.

**Table 2. Distribution of typhoid fever cases in Louisiana and Mississippi, 1947-52, by diagnostic criteria and by type of treatment**

Treatment	Total cases	Diagnostic criteria											
		<i>Salmonella typhi</i> cultured from—								Serologic evidence <sup>1</sup>		Epidemiological association <sup>2</sup>	
		Blood		Feces		Blood and feces		Total					
		Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Louisiana	910	165	18.1	208	22.9	149	16.4	522	57.4	354	38.9	34	3.7
Chloramphenicol	486	111	22.8	79	16.3	63	13.0	253	52.1	214	44.0	19	3.9
Nonspecific <sup>3</sup>	424	54	12.7	129	30.4	86	20.3	269	63.4	140	33.0	15	3.5
Mississippi	503	145	28.8	89	17.7	81	16.1	315	62.6	151	30.0	37	7.4
Chloramphenicol	313	107	34.2	46	14.7	37	11.8	190	60.7	103	32.9	20	6.4
Nonspecific <sup>3</sup>	190	38	20.0	43	22.6	44	23.2	125	65.8	48	25.3	17	8.9
Both States	1,413	310	21.9	297	21.0	230	16.3	837	59.2	505	35.8	71	5.0
Chloramphenicol	799	218	27.3	125	15.6	100	12.5	443	55.4	317	39.7	39	4.9
Nonspecific <sup>3</sup>	614	92	15.0	172	28.0	130	21.2	394	64.2	188	30.6	32	5.2

<sup>1</sup> Fourfold rise in titer or higher titer positive on single specimen plus epidemiological association with bacteriologically proved cases.

<sup>2</sup> Laboratory diagnosis incomplete but associated with proved cases.

<sup>3</sup> Includes penicillin, sulfonamides, streptomycin, fever pills, and aspirin.

**Table 3. Distribution of accepted cases of typhoid fever, by time of collection <sup>1</sup> of first negative fecal specimen and by method of treatment, Louisiana and Mississippi, 1947-52 <sup>2</sup>**

Treatment	Total	First negative specimen in week—									
		1		2		3		4-6		After 6 <sup>3</sup>	
		Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent	Num- ber	Per- cent
<i>Louisiana</i>											
Chloramphenicol.....	483	68	14.1	116	24.0	102	21.1	132	27.3	65	13.5
>30 gm. before day 15 <sup>4</sup> .....	205	35	17.2	65	31.7	46	22.4	38	18.5	21	10.2
>30 gm. after day 15 <sup>5</sup> .....	73	0	-----	3	4.1	21	28.8	33	45.2	16	21.9
<30 gm. <sup>6</sup> .....	205	33	16.1	48	23.4	35	17.2	61	29.7	28	13.6
Nonspecific <sup>7</sup> .....	406	36	8.9	92	22.7	68	16.7	122	30.0	88	21.7
<i>Mississippi</i>											
Chloramphenicol.....	307	41	13.3	76	24.8	54	17.6	73	23.8	63	20.5
>30 gm. before day 15 <sup>4</sup> .....	66	11	16.6	21	31.8	10	15.2	10	15.2	14	21.2
>30 gm. after day 15 <sup>5</sup> .....	28	0	-----	1	3.6	6	21.4	17	60.7	4	14.3
<30 gm. <sup>6</sup> .....	213	30	14.1	54	25.4	38	17.8	46	21.6	45	21.1
Nonspecific <sup>7</sup> .....	184	18	9.8	31	16.9	22	11.9	56	30.4	57	31.0
<i>Both States</i>											
Chloramphenicol.....	790	109	13.8	192	24.3	156	19.7	205	26.0	128	16.2
>30 gm. before day 15 <sup>4</sup> .....	271	46	17.0	86	31.7	56	20.7	48	17.7	35	12.9
>30 gm. after day 15 <sup>5</sup> .....	101	0	-----	4	4.0	27	26.7	50	49.5	20	19.8
<30 gm. <sup>6</sup> .....	418	63	15.0	102	24.4	73	17.5	107	25.6	73	17.5
Nonspecific <sup>7</sup> .....	590	54	9.1	123	20.8	90	15.3	178	30.2	145	24.6

<sup>1</sup> Week after onset.

<sup>2</sup> Includes all cases from which stool specimens were obtained, whether or not bacilli were found in any specimen. "First negative" means first negative specimen after which no positive specimens were obtained.

<sup>3</sup> Includes permanent carriers and persons who remained as temporary carriers for periods ranging up to 8 months.

<sup>4</sup> Total dose with course begun before 15th day of disease.

<sup>5</sup> Total dose but course initiated on or after 15th day of disease.

<sup>6</sup> Inadequate total dose without regard to time of initiation of treatment.

<sup>7</sup> Includes penicillin, sulfonamides, streptomycin, fever pills, and aspirin.

The ratios of male patients to female patients were 1.2:1 in Louisiana and 1.3:1 in Mississippi. Gross attack rates were higher in Louisiana than in Mississippi.

In table 2 the 1,413 cases are distributed by type of treatment and by the criteria upon which the diagnosis was based. Eight hundred and thirty-seven, or 59.2 percent, were diagnosed by isolation of *S. typhi*. Of these, 310, or 37.0 percent, had positive blood cultures; 297, or 35.5 percent, had positive fecal cultures; and 230, or 27.5 percent, were positive for *S. typhi* in both blood and feces. Five hundred and five, or 35.8 percent, were diagnosed on serologic evidence, and only 71, or 5.0 percent were diagnosed on the basis of epidemiological association. A greater percentage of positive

specimens were found among nonspecifically treated persons than among chloramphenicol-treated persons (64.2 vs. 55.4), whereas the reverse was true for serologic evidence (30.6 vs. 39.7). The percentages of epidemiological diagnoses were nearly identical (5.2 and 4.9). These differences are similar for each State although Mississippi had 5.2 percent more patients diagnosed by positive culture, slightly fewer diagnosed on serologic evidence, and twice the percentage diagnosed on epidemiological evidence.

Tables 3 and 4 show the relation between treatment and the percentage distribution of cases according to the week after onset in which was collected the first fecal specimen negative for *S. typhi* and not followed by a positive



**Table 4. Cumulative percentage distribution of accepted cases of typhoid fever, by time of collection <sup>1</sup> of first negative fecal specimen and by method of treatment, Louisiana and Mississippi, 1947-52 <sup>2</sup>**

Treatment	Cumulative percentage of cases with first negative specimen in week—				
	1	2	3	4-6	After 6 <sup>3</sup>
<i>Louisiana</i>					
Chloramphenicol.....	14.1	38.1	59.2	86.5	100
>30 gm. before day 15 <sup>4</sup> .....	17.2	48.9	71.3	89.8	100
>30 gm. after day 15 <sup>5</sup> .....		4.1	32.9	78.1	100
<30 gm. <sup>6</sup> .....	16.1	39.5	56.7	86.4	100
Nonspecific <sup>7</sup> .....	8.9	31.6	48.3	78.3	100
<i>Mississippi</i>					
Chloramphenicol.....	13.3	38.1	55.7	79.5	100
>30 gm. before day 15 <sup>4</sup> .....	16.6	48.4	63.6	78.8	100
>30 gm. after day 15 <sup>5</sup> .....		3.6	25.0	85.7	100
<30 gm. <sup>6</sup> .....	14.1	39.5	57.3	78.9	100
Nonspecific <sup>7</sup> .....	9.8	26.7	38.6	69.0	100
<i>Both States</i>					
Chloramphenicol.....	13.8	38.1	57.8	83.8	100
>30 gm. before day 15 <sup>4</sup> .....	17.0	48.7	69.4	87.1	100
>30 gm. after day 15 <sup>5</sup> .....		4.0	30.7	80.2	100
<30 gm. <sup>6</sup> .....	15.0	39.4	56.9	82.5	100
Nonspecific <sup>7</sup> .....	9.1	29.9	45.2	75.4	100

<sup>1-7</sup> See table 3.

specimen. Since the separate data for the two States are closely similar, attention need be directed only to the combined data for both States. From table 3 it appears that the greatest proportion of reversions occurred during the second week for the group given early adequate treatment, whereas it occurred in the fourth to sixth week for all other groups. Progress in clearing the fecal infection is shown more clearly, perhaps, by the figures for the cumulative percentages in table 4. Excluding the group which received delayed though adequate treatment and in which few isolations were attempted during the early weeks of the disease, the proportion which had permanently reverted was greater at each interval among those given chloramphenicol than among those treated nonspecifically. The most rapid clearing, of course, was in the group treated both early and adequately. In this group nearly half (48.7 percent) became negative during the second week as compared with 29.9 percent of those given only nonspecific treatment.

Twenty chronic carriers, 10 in each State,

were found among the 1,413 cases of typhoid fever in Louisiana and Mississippi. Table 5 shows the pooled data of the two States, with distribution of cases by age and sex only. In agreement with long-standing impressions, in all treatment groups carrier rates were higher among persons 20 years old and over than among younger persons. Combining all groups and the data from both States shows that the carrier rates were 0.7 percent for 851 patients under age 20, 1.9 percent for 363 patients aged 20-39 years, and 3.5 percent for 199 patients 40 years old and older. With regard to sex, the overall differences are in opposition to the usual experience but are trivial. The 782 male patients yielded 12 carriers, or 1.5 percent, whereas the 631 female patients yielded 8 carriers, or 1.3 percent. However, in the group with the highest number of carriers, those 40 years of age and older, the expected situation prevailed, with 5.2 percent of the females becoming carriers but only 2.4 percent of the males. Finally, while there were relatively fewer carriers among the specifically treated

patients (8 in an overall total of 799, or 1.0 percent) than among those given no specific treatment (12 out of 614, or 2.0 percent), the difference in rates is not significant. Thus, while the data are compatible with the idea that specific treatment reduces the carrier rate somewhat, they clearly do not prove it.

Table 6 presents the relation of intensity of specific treatment to relapse and death. It is interesting to note that when adequate dosage of chloramphenicol was given early, before the 15th day, the rate of relapse was 5.2 percent, practically the same as for the series with no specific treatment, 5.8 percent. In contrast, the group who had adequate treatment after the 15th day had a relapse rate of 21.5 percent, approximately the same as for the group who had inadequate treatment (21.9 percent). Those adequately treated before the 15th day had the lowest case fatality rate, 1.9 percent, whereas the group given no specific treatment had the highest rate, 8.1 percent. The rates for the series given adequate treatment but after the fifteenth day and for that series given

inadequate treatment were essentially the same, 5.0 percent and 5.1 percent respectively.

### Discussion

A field study of the type described has some obvious limitations as a method of studying the efficacy of chemotherapeutic agents. Many of the epidemiological record forms used were not really adequate for collecting and recording data pertinent to such a study. For instance, these forms had no specific blocks for recording treatment, name of hospital, admission and discharge dates, clinic or dispensary number, or name of county. The spaces allotted to the environmental history and laboratory data were very inadequate. It would have helped considerably in differential diagnosis to have had a checklist for clinical history, physical findings and course of treatment, with space for history of onset of illness and sequelae. Since adequate supervision cannot be given by the local health departments to patients with communicable diseases who are not hospital-

**Table 5. Relation of age, sex, and treatment to the development of the carrier state following typhoid fever in Louisiana and Mississippi, 1947-52**

Treatment and age group (years)	Typhoid cases			Typhoid carriers <sup>1</sup>					
	Male	Female	Total	Male		Female		Total	
				Number	Percent	Number	Percent	Number	Percent
Chloramphenicol.....	442	357	799	7	1.6	1	0.3	8	1.0
>30 gm. before day 15 <sup>2</sup>	163	109	272	3	1.8	1	.9	4	1.5
0-19.....	85	67	152	1	1.2	0	-----	1	.7
20-39.....	48	28	76	1	2.1	0	-----	1	1.3
40 and over.....	30	14	44	1	3.3	1	7.1	2	4.5
>30 gm. after day 15 <sup>3</sup>	55	47	102	0	-----	0	-----	0	-----
0-19.....	23	21	44	-----	-----	-----	-----	-----	-----
20-39.....	20	15	35	-----	-----	-----	-----	-----	-----
40 and over.....	12	11	23	-----	-----	-----	-----	-----	-----
<30 gm. <sup>4</sup>	224	201	425	4	1.8	0	-----	4	.9
0-19.....	149	134	283	2	1.3	0	-----	2	.7
20-39.....	45	50	95	-----	-----	-----	-----	-----	-----
40 and over.....	30	17	47	2	6.7	0	-----	2	4.3
Nonspecific <sup>5</sup>	340	274	614	5	1.5	7	2.6	12	2.0
0-19.....	201	171	372	2	1.0	1	.6	3	.8
20-39.....	89	68	157	3	3.4	3	4.4	6	3.8
40 and over.....	50	35	85	0	-----	3	8.6	3	3.5

<sup>1</sup> Persons found to be shedding typhoid bacilli 1 year or longer after onset of illness; deaths not deleted because they had no more than 0.1 percent influence.

<sup>2</sup> Total dose with course begun before 15th day of disease.

<sup>3</sup> Total dose but course initiated on or after 15th day of disease.

<sup>4</sup> Inadequate total dose without regard to time of initiation of treatment.

<sup>5</sup> Includes penicillin, sulfonamides, streptomycin, fever pills, and aspirin.

**Table 6. Relation of treatment to relapse and death following typhoid fever in Louisiana and Mississippi, 1947-52**

Treatment	Number of cases	Relapses		Deaths	
		Number	Per-cent	Number	Per-cent
Chloramphenicol:					
>30 gm. before day 15 <sup>1</sup>	272	14	5.2	5	1.9
>30 gm. after day 15 <sup>2</sup>	102	22	21.5	5	5.0
<30 gm. <sup>3</sup>	425	93	21.9	22	5.1
Nonspecific <sup>4</sup>	614	36	5.8	50	8.1

<sup>1</sup> Total dose, with course of treatment begun before 15th day of disease.

<sup>2</sup> Total dose, with course of treatment initiated on or after 15th day of disease.

<sup>3</sup> Inadequate total dose regardless of time of initiation of treatment.

<sup>4</sup> Includes penicillin, sulfonamides, streptomycin, fever pills, and aspirin.

ized, there is some doubt as to the accuracy of the treatment records of such patients. Fortunately, 1,067, or 75.5 percent, of the 1,413 cases under study in the 6-year period, 1947-52, in Louisiana and Mississippi, had been hospitalized. In Louisiana 20 percent more were hospitalized than in Mississippi. These percentages were 82.5 and 62.5 respectively. In both States 638, or 79.9 percent, of the treated patients and 429, or 69.9 percent, of the untreated group were hospitalized.

From table 2 it is evident that of the 1,413 cases included in the study 576, much more than a third, were diagnosed without positive cultures, either blood or fecal, and that positive blood cultures were obtained in only 540 cases, or about 38 percent, of the total. This situation merits some comment and explanation.

During the period of these investigations, I observed repeatedly that, in making a diagnosis of typhoid fever, the practice in many rural areas and in many small private hospitals is to depend only on serologic evidence and clinical symptoms. Fortunately, this applied to only a relatively small part of the study group since many establishments do not admit patients with known or suspected communicable diseases. Many of the cases of typhoid fever in this study were secondary and were picked up

by the local health departments while investigating primary or index cases.

Considering the study group as a whole, it might seem that the relative paucity of bacterial isolations, especially from the blood, could be attributed to the specific antibiotic therapy employed in more than half of the cases. Many investigators have reported that the use of chloramphenicol "sterilizes" the blood and intestinal tract very rapidly. Among these, Woodward and others reported blood sterilization but frequent persistence of the agent in feces and urine after initiation of treatment (14). Supporting these findings are observations of other investigators based on much larger numbers of cases (15, 16). On the other hand, using blood-clot cultures, Thomas and others (17) and Watson (18) report numerous isolations from patients undergoing treatment. The present data, when considered with reference to treatment status (table 2), provide no evidence that chloramphenicol influences the frequency with which positive blood cultures are obtained, as the tabulation below indicates:

Treatment	Percent of patients with positive blood cultures	
	Louisiana	Mississippi
All chloramphenicol-----	35.8	46.0
Nonspecific-----	33.0	43.2

Available evidence indicates that clot cultures are markedly superior to cultures made with whole blood, possibly because the influence of any bloodborne antibiotic and bactericidal serum factors is minimized (19). In spite of the general use of clot cultures, isolations of *S. typhi* from the blood in this series (540 or 56.8 percent of the 950 cases with blood culture attempted) were far less than reported by earlier workers (20, 21). As pointed out in most bacteriology texts, for example, Smith and others (10), frequency of isolations of *S. typhi* from the blood is closely related to the stage of the disease, maximum recoveries being made at the end of the first week. Thereafter, the bacteria disappear from the blood and specific antibodies increase. In this light possibly the more important factor contributing to the lower rate of recovery in this series was the common delay in obtaining the first specimen for culture and serologic tests.

With respect to positive stool cultures the



situation is somewhat different. That *S. typhi* was not recovered from the feces of 886 or more than four-sevenths of the entire group as a whole was very largely due to failure in many instances to collect stools for test during, or soon after, the acute phase of the illness. However, the data indicate rather clearly that treatment did exert an influence on the detected excretion of typhoid bacilli. As shown in table 2, in Louisiana positive stools were found in 142 of 486 treated patients (29.2 percent) and in 215 of 424 untreated patients (50.7 percent); in Mississippi, the figures were 83 of 313 treated (26.5 percent) and 87 of 190 untreated patients (45.8 percent). Furthermore, as shown in table 4, adequately treated cases tended to become permanently negative earlier (69.4 percent during or before the third week) than the untreated cases (only 45.2 percent by the same time). It should be emphasized, however, that treatment did not eliminate bacilli from the feces with any uniformity. In 81 cases feces were positive during therapy and in 130 after cessation of therapy.

Other factors also probably influenced the data as to fecal excretion of *S. typhi*. In uncontrolled field situations where specimens are collected at irregular intervals, it obviously is difficult to know the precise time when patients cease to excrete typhoid organisms. For purposes of tabulation, I have arbitrarily chosen the time intervals used in table 3 and have entered cases in the table as of the week of collection of the first feces or urine specimen negative for *S. typhi* not followed by a positive culture. Specimens were not submitted from all patients every week nor were they collected on the first day of the stated intervals.

In this study, an effort was made to determine the relation of the persistence of typhoid bacilli in feces to the degree and time of initiation of specified treatment. However, the frequent failure to collect stools for testing during the acute phase of typhoid fever makes it impossible to speak with assurance about the number or proportion of stools positive at any specific stage of the disease. The only definite statements that can be made are that, in any given case, stools taken on or after a certain date were negative and that by a given period after onset in a certain proportion of cases ex-

cretion of the bacilli had permanently ceased. These latter figures, obviously, are minimal since, if stools had been collected earlier or more frequently, the assigned date of cessation would have been advanced in many cases.

Of special interest in this study is the excretion of bacilli in the feces beyond 6 weeks from date of onset of typhoid fever. Of the 273 patients not declared permanently negative for *S. typhi* at the end of 6 weeks, 217, or about 16 percent of the total 1,380, were actually found to be excreting the organism at a later time (table 3). Patients determined as having ceased excretion of bacilli numbered 136 in the 6- to 8-week interval, 69 in the third month, 21 during the fourth month, 11 in the fifth month, and 16 during the next 3 months, leaving a total of 20 permanent or chronic carriers, 8 among the chloramphenicol-treated group and 12 among the group receiving non-specific treatment (table 5). Treatment, incidentally, did not appear to be an important factor in this group. The data in table 3 do suggest that in Mississippi a higher proportion of cases were found excreting the agent after the sixth week than in Louisiana. A partial explanation for this may be that, because of the recognized tendency for treated cases to relapse, it became routine in Mississippi early in 1950 before releasing any patient to obtain recheck specimens about 2 months after onset of typhoid fever.

Although not all of the factors involved in the production of a chronic typhoid carrier are known, at least some are reasonably well indicated. These include age, sex, prior gall bladder disease, and the bacterial strain. With a few specific exceptions, for example, Havens and Dehler (22), efforts to analyze large series of typhoid cases have led to the conclusion that both age and sex are important (23, 24). In general, carriers are more common among adults than among children and among women than among men. Frequency of clinically recovered patients who become chronic carriers varies between 2 and 7 percent. The pattern observed in the present series of 1,413 cases is in general agreement with the foregoing analysis. In the group aged 0-19 years, carrier rates of 0.7 to 0.8 percent were observed while in the older age groups rates ranged up to 4.5 percent.

Also, in the group over 40 years of age, 5.2 percent of females but only 2.4 percent of males became carriers. In the entire series, the carrier rate was 1.4 percent. Only in one instance was there a history of prior gall bladder disease although 3 of the 20 carriers recognized in this study later had cholecystectomies. Collins and Finland considered the possibility that strain differences may account for the variations in response to treatment with chloramphenicol (25). The belief that only infections with certain phage types result in the chronic carrier state has not been justified by my experience. In this country phage E<sub>1</sub> is the most common type. Of the 6 carriers typed in this study, 2 were E<sub>1</sub>. A note of possible interest is that 6 of the 20 newly established carriers in this study lived in the same household with previously known carriers, but only one was related by blood.

In the present study, the crucial question is the possible relation of treatment with chloramphenicol to ultimate evolution of the carrier state. Of the 8 carriers who received chloramphenicol, 4 had been given early adequate treatment and 4 were in the delayed or inadequate treatment group (table 5). Carrier rates for all groups given chloramphenicol and for the group given only nonspecific treatment were 1.0 and 2.0 percent respectively. Although the difference is not significant, it is compatible with the idea that such treatment may reduce the carrier rate to some extent. In support of this idea is the rather clear evidence that in many cases early adequate treatment hastens the time of cessation of excretion of bacteria.

Finally, the study provides data on the relation of treatment to relapse and death. Among the entire group of 1,413 cases there were 165 instances of relapse, or 11.7 percent. These were divided with respect to treatment. Many independent investigators have reported an increasing number of relapses among patients treated with chloramphenicol. Matteucci and others suggest that this evidence would seem to indicate that chloramphenicol therapy of typhoid fever is suppressive rather than curative (26). Smadel and his colleagues in 1949, working in Malaya with a series of 44 patients with typhoid fever, observed a

striking relation between the duration of chloramphenicol treatment and the incidence of relapses (27). They concluded that chloramphenicol should be administered in adequate amounts if relapses are to be avoided. Later Woodward used interrupted treatment in typhoid fever somewhat similar to that used to prevent relapses in the volunteers with scrub typhus (28). He reported no relapses among the eight cases given interrupted treatment.

However, in this study, it is quite possible that the actual percentage of relapses was higher than indicated since some of the patients may have had relapses after discharge from the hospital. These patients were not always followed. Furthermore, relapses were seldom recorded on the epidemiological record for nonhospitalized patients. Dubos states that relapses occur in about 10 percent of the cases and the "mortality rate in typhoid fever is about 10 percent" (29). He also states that in 60 to 75 percent of the fatal cases death is due to the complications of intestinal hemorrhage or perforation. Smadel and others emphasized that chloramphenicol therapy did not eliminate intestinal hemorrhages or intestinal perforation in typhoid (27).

In analyzing the data in this study, it was observed that complications occurred in 38, or 10.2 percent, of the 372 cases treated with 30 grams or more of chloramphenicol, and in 52, or 12.4 percent, of the 418 cases receiving less than 30 grams. In contrast, the control group consisting of 614 cases yielded 188, or 30.6 percent, complications. Some side effects of chloramphenicol were noted, but these were short lived.

## Summary

An epidemiological study to investigate the efficacy of chloramphenicol in the prevention of the typhoid carrier state was conducted among 1,413 cases of typhoid fever which occurred during the 6-year period, 1947-52, in Louisiana and Mississippi. The control group comprised 614 cases which occurred largely in the period from 1947-49. In the treated group were 799 cases which occurred during the period 1950-52.

Only 59.2 percent of the cases were diag-

nosed by isolation of *Salmonella typhi*; 35.8 percent were diagnosed on serologic evidence; and 5.0 percent of the diagnoses were based on epidemiological association plus symptoms compatible with those of typhoid fever.

In both States the highest attack rates were found in the group aged 5-9 years and the lowest in those over 40 years old. In all age groups, the rates were higher among nonwhites and males than among whites and females.

Age and sex are apparently important in the development of the typhoid carrier state. The rate of development of the carrier state in the group under 20 years of age was 0.7 percent as compared with 2.5 percent among the group aged 20 and over, a highly significant increase. Among patients 40 years old and over, 5.2 percent of females but only 2.4 percent of males became carriers.

Although early adequate treatment with chloramphenicol appeared to hasten the termination of excretion of *S. typhi* in many cases, evidence that early treatment acted to prevent the chronic carrier state is weak. The carrier rate for all patients treated with chloramphenicol was 1.0 percent and that of the nonspecifically treated group was 2.0 percent.

The study did provide evidence that early adequate treatment was followed by few relapses and few serious complications. Also, with early adequate treatment case fatality was low (1.9 percent) as compared with that in the nonspecifically treated group (8.1 percent).

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## Mathematics and Science Teaching

Improving the quality of science and mathematics education in the public schools is more important than increasing the number of students taking such courses, a group of prominent educators and scientists have concluded. A summary of their recommendations, *Guidelines for Science and Mathematics*, was issued in May 1958 by the Office of Education, Department of Health, Education, and Welfare.

This statement emphasized that mathematics and science teaching should develop the capacity of boys and girls to think for themselves, as well as communicate facts. Some specific guidelines offered by the group were:

- Students should have the opportunity for continuous experiences with science from kindergarten through high school.
- Science and mathematics should be taught as basic sciences. The teaching of them should impart an understanding of the methods of scientific investigations and research.
- Able students should be offered at least the first year of college work while in high school.
- Continuous training of science and mathematics teachers is required to keep abreast of the changing methods and knowledge.

Additional recommendations concerned curriculum, revision of textbooks, selection of pupils for advanced courses, the use and training of teachers, and other aspects of science and mathematics education.

The guidelines were developed following a conference of educators and scientists held at the Office of Education, Washington, D. C., in February 1958. Its sponsors were the American Association of School Administrators, Council of Chief State School Officers, American Association for the Advancement of Science, National Association of Secondary School Principals, and the Scientific Manpower Commission.

## *Group Psychiatric Consultation for Nonpsychiatric Workers*

**T**HERE is a need to broaden the education of nonpsychiatric professional groups, such as school teachers and nurses, concerning the nature of mental and emotional problems which they encounter in their work and to increase their awareness of relationships between themselves and their pupils or patients. However, the techniques most effective in consulting with these groups may vary somewhat from those with which most psychiatrists are familiar. Therefore, attempts are being made to determine how a psychiatric consultant can be most useful to agencies not specifically concerned with psychiatry, and to their personnel.

A study of the image which public health nurses and school teachers have of themselves within their professional roles indicates that, in order to satisfy their need for a feeling of professional status, they must be given a strengthened sense of the value of their function and an understanding of motivations for behavior which seems to depreciate their role. The close adherence of teachers and nurses to middle-class mores and the anxieties engendered when these are violated require psychological reorientation to many phases of their work.

### **Consultant's Role**

One of the primary functions of a psychiatrist in a health department or school is the inservice training of nurses and teachers in understanding the problems of mental function and dysfunction. An important implicit goal of such a training program is to increase the effectiveness of these workers by reducing their anxieties and distortions in relationships which interfere with objectivity on the job.

In contrast to the group therapist, the consulting psychiatrist must focus on the worker's

relationship to her work problem rather than on the intrapsychic roots of her conflicts. In order to be most effective, he must be able to gauge the degree of self-awareness of a group, and, in working with nonpsychiatric personnel, he must gear the level of discussion to the tolerance of individuals who are often more naive about



Public Health

**MONOGRAPH**

**No. 53**

The accompanying summary covers the principal findings presented in Public Health Monograph No. 53, published concurrently with this issue of Public Health Reports. The author is mental health consultant to the Berkeley City Health Department, Berkeley, Calif.

Readers wishing the report in full may purchase copies of the monograph from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. A limited number of free copies are available to official agencies and others directly concerned on specific request to the Public Health Service. Copies will be found also in the libraries of professional schools and of the major universities and in selected public libraries.

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Parker, Beulah: Psychiatric consultation for nonpsychiatric professional workers. Public Health Monograph No. 53 (PHS Pub. No. 588). 23 pages. U. S. Government Printing Office, Washington, D. C., 1958. Price 25 cents.

psychological matters than are other professional groups with whom he has had experience in his training and mental health clinic work.

In order to influence the content of group thinking, the psychiatric consultant must help to alleviate the anxieties which impede learning by the worker. The major problem of a consultant to an agency such as a health department is determination of the degree to which he can influence the group's thinking, explicitly by direct discussion of an individual worker's involvement in her case and implicitly by a more generalized handling of the material presented for discussion. While explicit discussion is frequently possible when group morale permits, in most cases anxieties can be allayed implicitly without focusing personally on the worker.

### **The Berkeley Program**

From a study of 117 group sessions with public health nurses during a 4-year inservice training program in the city health department of Berkeley, Calif., theoretical concepts and a formulation of objectives and methods of psychiatric consultation have been developed.

The subjects brought up for discussion in these sessions and the reasons given for presenting them indicate clearly that nurses are primarily concerned with their own functioning and have only a secondary academic interest in the theories and dynamics of emotional disturbance. Their interest in human behavior and motivation is based on a desire to be able to work more effectively with the people whom they encounter in their work and to avoid the anxiety aroused by attitudes on the part of those people which they consider antisocial or rejecting of themselves. The real question behind nearly half the subjects the nurses brought up for discussion, apart from their content, was: How can I change the behavior or motivation of the patient to conform to my standard?

In 80 percent of the cases, the psychiatrist sees the nurses' difficulties as primarily due to emotional reactions interfering with their objectivity. Lack of knowledge, techniques, or interviewing skills sometimes contributes to a nurse's uncertainties, but in the vast majority of cases she can solve her work problem once she sees clearly what is going on between herself and her patient.

## **WHO Publications**

**International Standards for Drinking-Water.** (1958, 152 pages, \$4.00.) Designed to stimulate further investigations of the problem and immediate consideration of the function of water quality criteria in control and improvement of water treatment and provision of safe and potable water to all people. Among sources used in preparing material were The Bacteriological Examination of Water Supplies, of the Ministries of Health and of Housing and Local Government for England and Wales, and Standard Methods for the Examination of Water, Sewage, and Industrial Wastes, 10th edition, of the American Public Health Association.

**Insecticide Resistance in Arthropods.** (By A. W. A. Brown, 1958, 240 pages, \$5.00.) Exhaustive account, based on some 625 publications and much unpublished information, of the appearance, history, and geographic distribution of resistance for 40-odd species.

**Publications of the World Health Organization, 1947-1957: A bibliography.** (1958, 128 pages, \$3.25.) Almost 2,000 items, comprising technical, general, and administrative articles and publications, serially numbered and grouped in alphabetical order by subject, with author and country indexes.

**Annual Epidemiological and Vital Statistics, 1955.** (1958, 699 pages, \$12.00, bilingual edition: French and English.) Eighth annual volume containing such new data as specific mortality rates, by sex and age, for main sites of malignant neoplasms and distribution of cases of communicable disease by sex and age.

*These publications may be obtained in the United States, directly or through a bookseller, from the Columbia University Press, International Documents Service, 2960 Broadway, New York 27, N. Y.*



# publications

**Register of Air Pollution Analyses as of January 1, 1956.** *PHS Publication No. 610; 1958; 331 pages; \$1.75.*

A record of community air sampling and analyses performed in continental United States, Alaska, and Hawaii before 1956 is compiled in tabular form. More than 100 chemically definable individual pollutants or constituents of mixed ones, such as dustfall, are listed for 200 cities in 100 counties of 32 States and Territories.

In addition to pollutants, dates, number of sampling stations, length of sampling periods, sampling frequency, sampling equipment, and analytical methods are listed for each survey. The register also gives literature references and addresses of agencies where results of analyses are recorded. An index of pollutants identifies States and cities in which each was collected and analyzed.

**Grants and Fellowships.** *PHS Publication No. 624; 1958; 311 pages; 75 cents.*

Health research facilities grants, research fellowships, and research grants awarded by the National Institutes of Health, Public Health Service, during fiscal year 1958 are listed separately by State and institution.

An expanded version of a yearly report on research support, this volume contains a list of the advisory bodies responsible for review of research grant applications and a table showing distribution of grants by States and grantee institutions.

**Public Health Records and Related Materials.** *PHS Publication No. 612; 1958; 108 pages; \$1.*

Selected articles which have appeared in the *Journal of the American Public Health Association* and *Public Health Reports* from 1952 through 1957 have been compiled in this publication. Emphasizing that records cut across program lines and

involve all disciplines, the selections give examples of specific application of principles for improving recording and reporting in public health work.

Among the suggestions offered are a forms control program instituted as agency policy, work simplification, central control of services to individuals and families, and exchange of information between programs.

**The Air Over Louisville.** *Publication of Jefferson County and the City of Louisville, Ky.; 1958; 57 pages.*

A summary report of an intensive study of air pollution conducted by the Air Pollution Control Board of Jefferson County, the Public Health Service, and other agencies, this booklet describes a 2-year investigation which began in mid-October 1955. A full-scale technical report on the same study is being prepared by the Public Health Service and will be available at a later date.

Copies of both reports may be obtained from Chief, State and Community Services Section, Community Air Pollution Program, Robert A. Taft Sanitary Engineering Center, Cincinnati 26, Ohio.

**Public Health and Hospitals in the St. Louis Area.** *American Public Health Association Publication; 1957; 414 pages; \$3.75.*

An evaluation of existing services and facilities and specific recommendations to meet current and potential needs are presented in this study. Hospitals and nursing homes, welfare services, rehabilitation, mental health, nursing, dental health, tuberculosis, child health, and health education are covered.

Based on a survey conducted by the American Public Health Association, the appraisal summarizes data gathered from questionnaires, personal interviews, conferences, correspondence, and public hearings.

The Public Health Service, the Children's Bureau, and the Office of Vocational Rehabilitation participated in the study and helped with staff and consultant services.

Copies of the book may be purchased from the Health and Welfare Council of Metropolitan St. Louis, 417 N. 10th Street, St. Louis 1, Mo.

**Administrative Medicine. Transactions of the fifth conference, October 29-31, 1956.** *Edited by George S. Stevenson, M.D.; Published by the Josiah Macy, Jr. Foundation; 1958; 197 pages; \$3.75.*

Mental health elements in administration of general health programs, the administrative role in the management of a mental hospital, and techniques and devices for communication and cross-fertilization in the coordination of local resources were the topics at the fifth conference on administrative medicine.

With emphasis on discussion rather than formal presentation, the book retains the conversational style of the conference. Questions, criticisms, and comments by participants are recorded.

George St.J. Perrott, former chief, Division of Public Health Methods, Public Health Service, was chairman of the conference, and several other Public Health Service personnel were members or guests. Copies of the transactions may be purchased through a bookdealer or from Josiah Macy, Jr. Foundation Publications, 16 West 46th St., New York 36, N. Y.

This section carries announcements of new publications prepared by the Public Health Service and of selected publications prepared with Federal support.

Unless otherwise indicated, publications for which prices are quoted are for sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Orders should be accompanied by cash, check, or money order and should fully identify the publication. Public Health Service publications which do not carry price quotations, as well as single sample copies of those for which prices are shown, can be obtained without charge from the Public Inquiries Branch, Office of Information, Public Health Service, Washington 25, D. C.

The Public Health Service does not supply publications other than its own.

# ECHOES from Public Health Reports

## Diarrheal Disease Control Studies

### I. Effect of Fly Control in a High Morbidity Area

By JAMES WATT, Surgeon, and DALE R. LINDSAY, Scientist <sup>1</sup>

Common consent for years has ascribed to the fly a major role in the spread of enteric infections. Evidence for this belief was incomplete and did not permit an evaluation of these insects as disseminators of disease. The development in recent years of more potent insecticides, particularly DDT, made it possible to plan and carry out an experiment on a broad scale designed to answer the following questions: (1) Can flies be controlled in urban populations by insecticidal methods under the limitations of action imposed by civilian life? (2) What effect, if any, will such control have on the acute diarrheal diseases of the community, particularly those caused by specific infection with the *Shigella* and *Salmonella* groups of micro-organisms?

The basic needs for such a study were: An area with a significant amount of infectious diarrheal disease; a major fly problem; and geographic location which would permit division of the human population along natural lines into two comparable areas, one to be treated, the other to be left untreated for comparison purposes. This latter condition was essential, since it is known that variations in diarrheal disease rates greater than 100 percent occur from year to year and season to season.

#### Plan of Study

Such an area was found in the Lower Rio Grande Valley of Texas, and at the request of Dr. George W. Cox, State Health Officer, and the local officials, Hidalgo County was selected as the study area.

<sup>1</sup> From the Division of Infectious Diseases, National Institutes of Health, Bethesda, Maryland, and the Entomology Division, Communicable Disease Center, Atlanta, Georgia.

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In the first controlled study of the role of nonbiting flies in human disease, Dr. James Watt and Dr. Dale R. Lindsay presented evidence on the importance of flies in the transmission of bacillary dysentery.